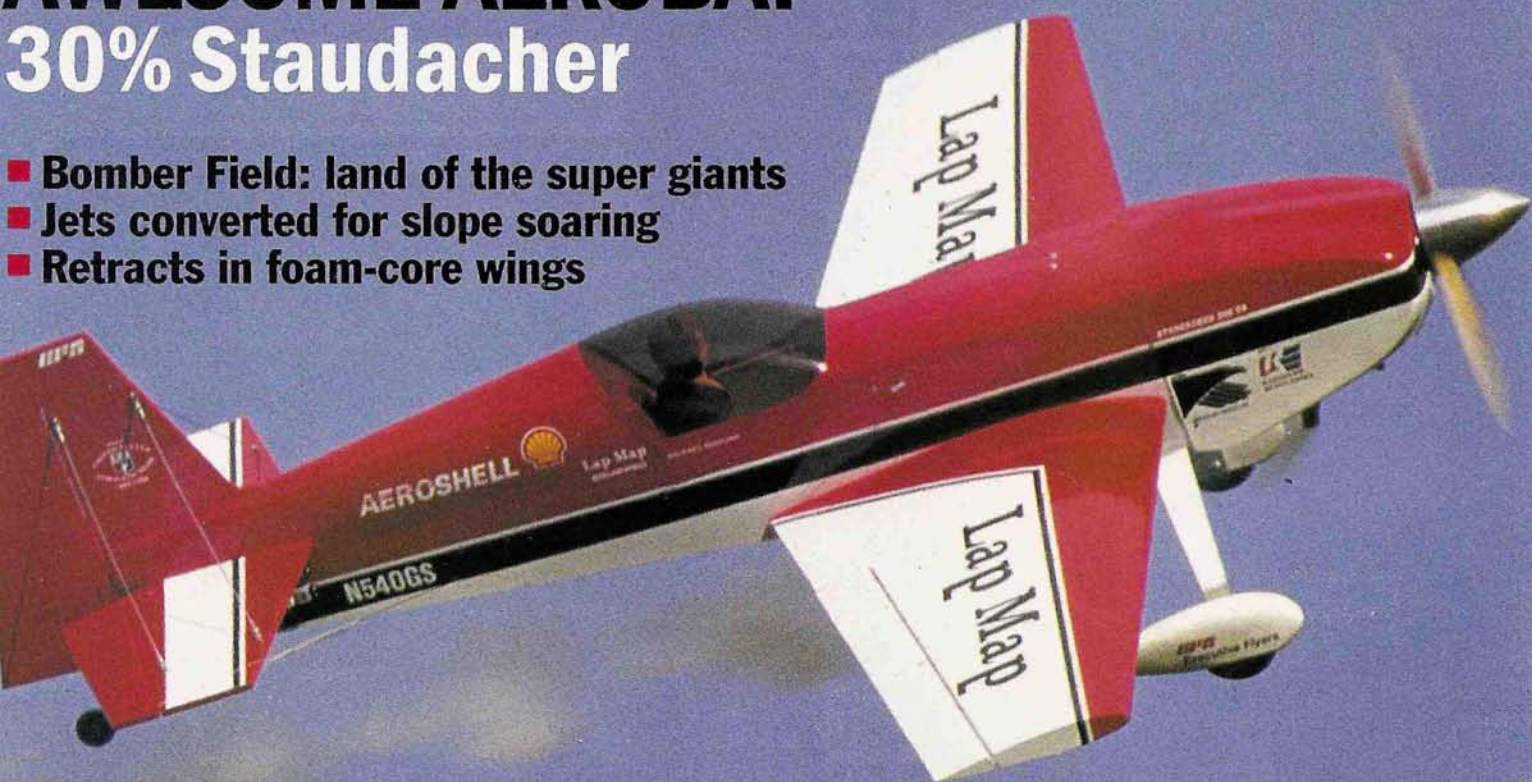


# MODEL Airplane NEWS

## AWESOME AEROBAT 30% Staudacher

- Bomber Field: land of the super giants
- Jets converted for slope soaring
- Retracts in foam-core wings



## WWI PRODUCT GUIDE

# 86

**KITS FEATURED PLUS ACCESSORIES,  
PLANS & ENGINES**



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April 2000

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AirAGE



## History comes alive

**T**he romance and nostalgia associated with early aviation are certainly part of the appeal of WW I models. Their endless scale possibilities and simple yet elegant lines are also attractive features. If you've ever thought about building a WW I model, this month's guide on page 26 will help you decide

models ... well, even our own Gerry Yarrish—a giant-scale modeler himself—was impressed by their stupendous size and detail. Among the 250 models at Bomber Field '99 were five Flying Fortresses, a 14-foot-span Enola Gay, a B-24, and even a 21-foot-span Tupolev Tu-95 built by B.B. Weber, who hosts the



where to start. We've compiled the statistics of 86 RC WW I kits; everything from giant-scale glow and gas models to ARFs and micro electric planes. We also provide information on where to buy plans, documentation and accessories—from pilot figures to machine guns! Revisit the glory days of aviation, when the Red Baron and Eddie Rickenbacker ruled the skies, and those daring young men in their flying machines won our hearts.

### BOMBER FIELD

Some people say, "Everything's bigger in Texas," and as far as the Bomber Field Big

event. Gerry brought back some terrific photos of these incredible models, and he fills us in on his trip to Bomber Field on page 36. After reading his article, you'll see why these Texas modelers believe that "Bigger is better."

### PLANS OF THE MONTH

This month, we offer two unusual—but radically different—construction designs. Roy L. Clough Jr.'s Dragonflyer is a great subject for those who are inclined toward outlandish, one-of-a-kind models. Relatively easy to build, this design uses a rotating, vaned disk for lift and has a large stabilizing fin that's shaped like a dragon. Lifting-disk models have been around since the '30s, but the Dragonflyer takes this planform to a new level. You're sure to turn heads when you bring this model to the field!

For scale buffs, we offer Phillip S. Kent's Skyfarer plans. In the 1930s, novice pilots could solo this twin-tail, two-control cabin monoplane after only three or four hours of instruction.

As a model, the lightly loaded Skyfarer is as easy to fly as a trainer and would be an excellent first scale project.



Bird Fly In is concerned, it's true. The event attracts thousands of spectators, boasts a 50-acre flying field, and the

# MODEL Airplane NEWS

FOUNDED 1929

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# MODEL Airplane NEWS

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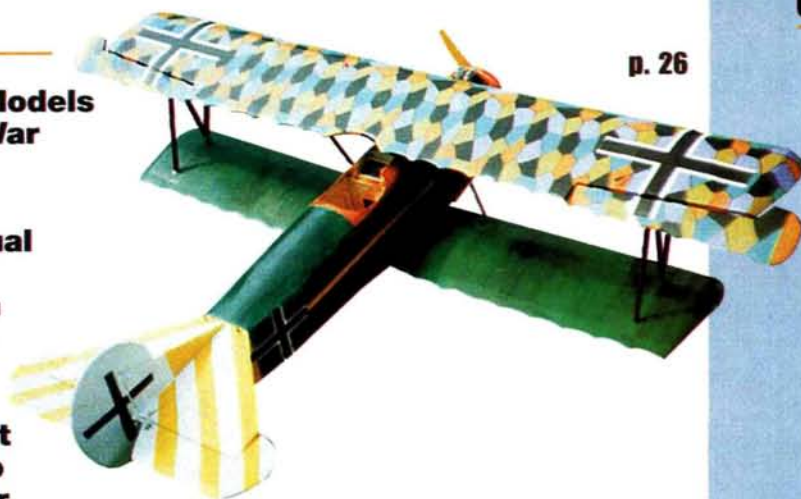
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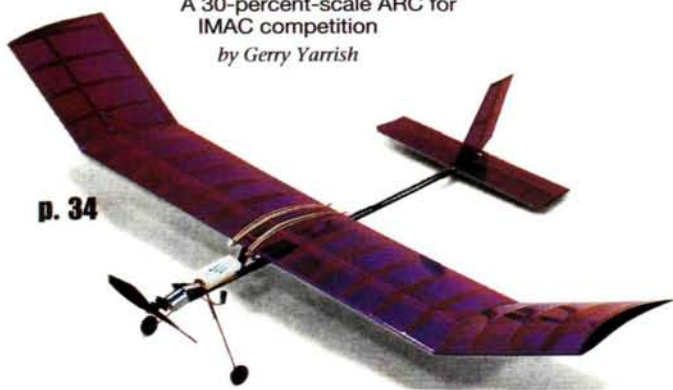
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ON THE COVER: main image—the big and beautiful GiantScalePlanes.com Staudacher performs a smoking slow roll (photo by Walter Sidas). Insets—the new Saito FA170R3 radial that Chris Chianelli reports on in "Air Power"; and Gerry Yarrish covers "Texas-style" giant-scale at the Bomber Field Fly In.

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## BOOST BOTTLE FOR PLANES?

Would boost bottles, like those used in RC cars, help airplane engines (in the .40 to .46 range) enough to make up for the added weight in an aerobatic plane? Keep up the good work! [email]

MICHAEL BOGGESS

Michael, while boost bottles are very light and would add no significant weight to an airframe, they are, in my opinion, virtually useless on an aircraft. Contrary to popular belief, boost bottles do not, in the least, increase an engine's maximum power output; they simply smooth out low- and mid-range throttle transitions. Because of the radical porting in today's 2-stroke glow engines, a phenomenon known as reversion can occur. This is most noticeable as a "spitting back" of fuel out the carb during acceleration from low- or mid-throttle settings, which leads to momentary hesitation. Though fleeting, this slight hesitation can be a problem with an RC racecar where mid-range throttle is applied much more frequently and in rapid succession. Just think about a car snaking its way through many tight turns in a racecourse, and you'll see that the need for such "throttle jockeying" is clear. With aerobatic airplanes, where the throttle is applied far less and in a much more relaxed fashion from idle to full throttle, the boost bottle doesn't seem worth the effort.

CC

## GAS ENGINE INSIGHT

I read with interest the "Thinking Big" column in which you explained the starting procedure for gas-engine engines. I am a newbie to giant scale and have had problems starting my Quadra. I now realize that I just wasn't getting enough fuel to the carb. Using my thumb as the choke really makes it easy. I do have other questions, though, and I hope you can help. I converted a HomeLite 30cc industrial engine to RC use and want to know what you would recommend for the throttle linkage setup. I know I need some sort of 90-degree bellcrank, but I was hoping you could explain the finer details.

Can I make my own, or should I buy one?

HARTMUT UNGER

New York, NY

Hartmut, I am glad you've found the "Thinking Big" column helpful; even though

gas engines have been around for a very long time, many of the basics haven't been completely explained. It is relatively easy to assemble your own throttle linkage. I use a length of 4-40 threaded rod, a couple of Rocket City heavy-duty ball-link clevises (available from the hobby shop) and a nylon, 90-degree aileron bellcrank with attachment hardware (nuts, washer and bolt).

First, disengage (but don't remove) the throttle tension spring from the throttle arm. This makes it easy for the servo to open and close the throttle. If there are already holes in the arm, insert one of the ball-link balls and tighten it into place. If there aren't any holes, carefully drill a  $\frac{3}{32}$ -inch hole in the arm and install the ball as far out on the arm as you can. Now, take two of the ball-link clevises and connect them by threading them onto a 1-inch length of 4-40 threaded rod. Depending on your setup, the rod can be longer, but I have found the 1-inch length to be fine. Note that the two clevises will touch each other and completely cover the rod. Attach the rod to the bellcrank and then attach the assembly to the throttle arm. Hold the throttle in the  $\frac{1}{2}$ -open position, and then place the bellcrank against the engine mount so that one of its arms is pointing straight up and down. Mark the location for the bellcrank attachment bolt, drill a hole and insert the mounting bolt. Install the bellcrank and use a jam nut to prevent the attachment nut from tightening against the bellcrank. That's it; you may have to adjust the length of the linkage a little, but it's that simple, and it costs only a couple of dollars. Good luck. GY

## THAT DARN CROSSWIND

Help! The other day I was out at the field, and the wind was 30 degrees from the centerline of the runway, blowing at 7 knots. Since I'm a fairly new RC pilot and didn't want to wreck my plane, I left it in the car and watched the others try to combat the elements. Most were unsuccessful; not all of them destroyed their models, but they sure

didn't come close to landing on the runway, either. Can you help?

[email]

F.H. O'HARA

There are two methods of controlling your plane during a crosswind approach. One is to crab the nose of the model into the wind by applying and holding some rudder. This keeps

## Model Airplane News Great RC Design Contest

Don't forget to enter your original model in the upcoming Design Contest! The deadline is June 1, 2000, and your design could even be featured in the magazine as a construction article.

**First place** \$750  
**Second place** \$500  
**Third place** \$350

Runners-up will receive a Model Airplane News T-shirt and 6-month subscription.

### How to enter

- Submit several clear photos of your model (including at least one flight shot) and specifications to Model Airplane News, Great Design Contest, 100 East Ridge, Ridgefield, CT 06877-4606 USA, by June 1, 2000. Submitted materials cannot be returned.

- Only designs that have never been submitted for publication, published, or manufactured are eligible. (Those published in "Pilot Projects" are still eligible.) There is no restriction on the type of RC plane, as long as it is your own design. The Model Airplane News editors will choose the winning designs.

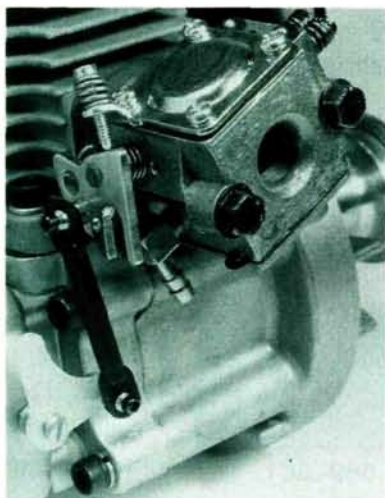
- All entrants must be prepared to submit a complete construction article (6 to 8 complete, typed pages, preferably on diskette), good B&W photographs of the building sequence, full-size construction plans and color slides of the model, both on the ground and airborne.

- If Model Airplane News prints your construction article, you will receive additional payment. Although Model Airplane News will have the right to print and sell your plans, you will retain the rights to your design.

the plane from drifting off the runway centerline that you (hopefully) have lined up on after turning onto the final approach. When the plane gets closer to the touchdown point, the rudder correction is released, and some aileron is added. This added aileron would be on the side of the plane from which the crosswind is coming, i.e., if the wind is hitting the left side of the plane, left aileron is added. This helps to keep the plane from being flipped over by a gust of wind. To keep the plane from drifting off the centerline, or possibly rolling into a bank into the direction of the crosswind, some opposite rudder is added. Depending on the direction of travel and from which side the wind is coming, your transmitter sticks will either be pushed together or pulled apart (horizontally speaking).

The other method is to use the second half of the first method through the entire approach. The upwind wing is lowered into the wind by the aileron, and the track is kept straight by adding opposite rudder (a slide slip). In both cases, the amount of stick input will vary constantly, so do not lock your thumbs into one position and think that this will be the magic solution. Also, remember that power is altitude and pitch is airspeed. In a windy situation, don't pull on the elevator to make the model go up. It will only slow down the plane and make it stall. Good luck.

RP





**New products and people behind the scenes;** my sources have been put on alert to get the scoop! In this column, you'll find new things that will at times cause consternation, and telepathic insults will probably be launched in my general direction! But who cares? It's you, the reader, who matters most! I spy for those who fly!

**AIR  
SCOOP**  
BY CHRIS CHIANELLI



AEROLOFT  
DESIGNS

## A-7 Corsair II

Maybe you think this A-7 is beyond your capabilities because it's a jet, but suppose I told you that this Corsair is designed to be an *entry-level* jet! Aeroloft Designs created the fiberglass A-7 for short-field

operation. Because of its large wing (big enough, according to Aeroloft, for the model to glide back to the field in the event of a flameout) and the A-7's basic shoulder-wing design, it's an inherently stable platform. The kit includes an epoxy fiberglass fuselage and foam wings and surfaces. The kit is set up with either Ramtec or Byron ducted-fan power, using the O.S. .91 VR DF engine.

Aeroloft Designs, 7919 E. Mawson Rd., Mesa, AZ 85207; (480) 380-4799; fax (480) 380-4843.

## SLIP STREAM AVIATION 1/5-SCALE

I witnessed Wayne Handley's airshow performance, and the images of his Turbo Raven are seared in my memory. Never had I seen a full-size plane perform like one of my "ultra-mega-nuclear-powered" RC aerobats. Think I'm kidding? The Turbo Raven is the prop-driven plane that set the new time-to-climb record: from sea level to 9,843 feet in less than 1 minute, 10 seconds! Since Wayne's red rocket has large surfaces, Slip Stream Aviation was able to design an RC version in exact scale without deviating

from the original's outline. The gelcoated, 59-inch-wingspan ARF has a one-piece, hollow-core wing with epoxy, glass and carbon-fiber construction, carbon-fiber gear



## Turbo Raven ARF

and gap-less, "skin-hinged" control surfaces. It's available in three versions: ARF, ARF with applied gold border mask, or completely ready-to-fly with painted graphics. Specs: wingspan—59 inches; length—54 inches; weight—7.5 pounds; engine—.60 2-stroke or .91 4-stroke.

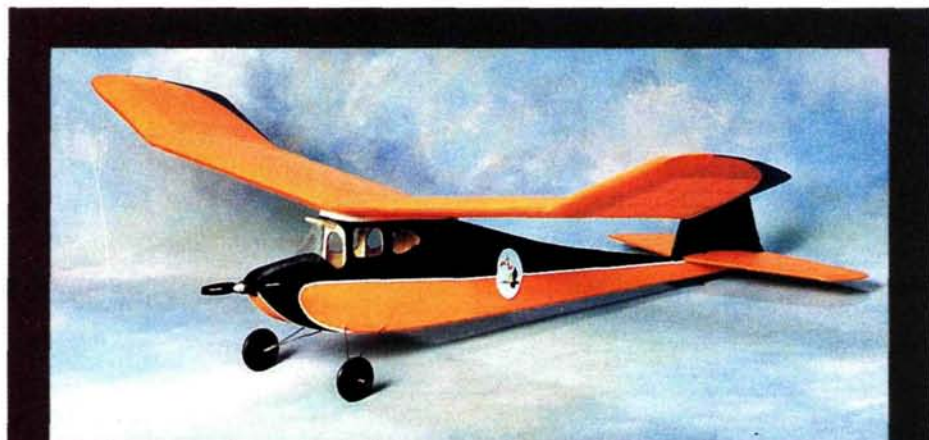
Slip Stream Aviation, 935 Tamarack Ave., San Jose, CA 95128; (408) 248-4642; [www.slipstream-aviation.com](http://www.slipstream-aviation.com).





## The Colonel's Eagle

Col. Robert E. (Bob) Thacker has come up with another beauty to share with us: his F-15 "Active" is based on NASA's experimental Eagle that "borrowed" the horizontal stabs from an F-18 and employed them as canards, in addition to having variable-angle thrust nozzles. The Colonel became interested in creating the model after he spent some time at the Dryden Test Center at Edwards AFB. The modified, full-scale F-15 had its landing speed reduced by an amazing 40 knots! His model uses a Tom Cook fan unit with a K&B .82 engine and Byron fuel. The modified model is controlled with an Airtronics 1000. Specs: wingspan—50 inches; canard span—27 inches; weight—13.5 pounds; wing loading—28 ounces per square foot; engine—K&B .82 ducted fan.



## SPRIT OF YESTERYEAR Buzzard Bombshell

**T**he Buzzard Bombshell is a modeling icon that marks the transition from 1940s free flight to radio control. Though there were many fine free-flight models from that era, it's the Bombshell that stands out in history as the test-bed of those early RC systems. Spirit of Yesteryear has reintroduced this "king of the classics" and now offers it as a laser-cut kit, designed for use with a Speed 400, a 15A speed control and today's lightweight electronics. And let me put a stop to the rumors here and now; that is *not* my likeness on the side of the plane. Specs: wingspan—46.5 inches; wing area—354 square inches; power—Speed 400.

Spirit of Yesteryear Model Aircraft Co., 40 Holgate St., Barrie, Ontario, Canada L4NT7; (800) 670-5468 or (705) 737-0532.

## Return To Rhinebeck The Calendar

2000

## RETURN TO RHINEBECK WITH ITS 2000 CALENDAR

I know we're well into Y2K, but the photos in this calendar are too good to miss. Its 13x22-inch, full-color calendar features 12 great months of antique airplane images from the Aerodrome collection, shot by internationally known aviation photographer Mike Vines. Included are photographs of the Fokker triplane, Sopwith Camel, Curtiss Jenny, Great Lakes and several other old favorites,



all suitable for framing. The calendars are \$8.95 each plus \$4 S&H for the first calendar and \$2 for each additional calendar mailed to the same address in the continental U.S. New members who sign up at the \$50 level (or higher) will receive a free calendar while supplies last. For further information and shipping rates outside the continental USA, contact Rhinebeck Aerodrome Museum, P.O. Box 229, Rhinebeck, NY 12572; (914) 752-3200; fax (914) 758-6481; [www.ldrhrinebeck.org](http://www.ldrhrinebeck.org).




**D&L DESIGNS**

## EDGE 540 PLANS OR KIT

If the combination of crisp aerobatic capabilities and easy slow-flight characteristics appeals to you—then so should the Edge 540. According to the manufacturer, D&L Designs, this model possesses these qualities and is offered in 1/8-scale as either a laser-cut kit or plans only. Part of the 540's secret is its unique "variable-airfoil" that changes throughout the span and accounts for its great, low-speed handling characteristics. The laser-cut kit includes preprimed fiberglass cowl and wheel pants, tempered-aluminum landing gear, canopy and hardware, three sheets of plans, 12 pages of instructions and 70 B&W photos to aid your building. If you'd rather scratch-build the Edge, the rolled

plans, photos and manual are available separately. Price—\$149.95. Specs: wingspan—60 inches; weight—6¾ to 7½ pounds; engine—.45 to .61 2-cycle, or .48 to .70 4-cycle; radio—4-channel with five servos.

D&L Designs, 1145 E. Kleindale Rd., Tucson, AZ 58719; (520) 887-0771; [dldesigns.home.mindspring.com](http://dldesigns.home.mindspring.com).



A.J. ENGINEERING

## Kirk Stinger 1.5

My passion for engines is no secret. I can smell a nitro-burner in a shipping carton the way an airport dog sniffs out illicit substances. Take a look at the Stinger 1.5. It's a billet-machined, all bearing/roller bearing 1.5ci 2-stroke engine. You want performance? How does 3hp at 7,400rpm turning an 18x8 Zinger sound? According to the manufacturer, those impressive numbers were obtained with 5-percent glow fuel, but you can buy the Stinger with spark ignition and burn gas instead because the carb meters either gas or glow fuel. Multi-engine pilots will be glad to know that the engine spins in either direction without doing any mods.

A.J. Engineering, N5338 County S., Plymouth, WI 53073; (920) 893-9675.

## SIX PLANES



## IN ONE?



## THE PILOT MAKER

**T**he Pilot-Maker 4025 ARF is primarily an RC trainer that can easily be reconfigured as the new pilot becomes more experienced. It's uniquely capable of being transformed from a tricycle-gear trainer to a tail-dragger in less than 5 minutes, at the field or at home. Moreover, this same trainer can also be transformed from either tricycle or tail-dragger to floats in about 5 minutes.

But wait ... there's more! The Pilot-Maker 4025 can be converted from a .40-powered single to a .25-powered twin by tucking an engine under each wing. This transformation can take less than 1½ hours, depending on the pilot's abilities.

Alrodee Intl. is also working on a Pilot-Maker 2515 (one .25 or two .15s) and a Pilot-Maker 6035 (that's right; one .60 or two .35s).

Alrodee Intl. Inc., hyperlink <http://www.alrodee.com>, or call (888) 259-8896. +



# PILOT PROJECTS

*A look at what our readers are doing*



## HAWK TALK

This Curtiss Hawk P-6E was built by LaRoy H. Michelson of Fresno, CA. Mick, as he is also known, started with a Royal kit, then added his "trusty, old," O.S. .60 plain-bearing engine. The covering is orange-and-olive-drab Solartex, and Mick used a foam brush to apply the Nelson Aircraft clear gloss finish. This 62-inch-span bird weighs 9½ pounds. The Hawk's takeoff and flight characteristics are said to be great. Landings are "interesting," because of the stiff, narrow gear, according to Mick, so he lands on the wheels, flying with the rudder until the plane stops.



## ZERO, ZERO . . . UFO!

Now that we've seen the "Y2K Saucer," we're wondering whether all of those UFO sightings were optical illusions or, perhaps, something else entirely. John Georgoff built this unique craft out of balsa, plywood and foam in his Battle Creek, MI, home. Jet black on the bottom and silver on the top, the saucer lends itself to great optical illusions. It looks somewhat scary, and the twin K&B .21 engines add sound to complete the scene.

## HURRICANE WARNING

Hawker Hurricanes filled the sky during WW II's Battle of Britain, and Warner Lowe is trying to do the same for the skies over Oregon's Lake Oswego. This Hurricane IIC was built using Aerodrome Models plans and was then modified to electric power. It has a 66-inch wingspan and weighs 10½ pounds. An Aveox motor and gearbox and a 13x8 prop pull this model through the air, and the operational Robart retracts and landing flaps add a nice touch. It took Warner several years to build, but the result was worth it.



**SEND IN YOUR SNAPSHOTS.** *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable. We receive so many photographs that we are unable to return them.

All photos used in this section will be eligible for a grand prize of \$500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in!

Send those pictures to: Pilot Projects, *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.



## MIGHTY MESSERSCHMITT

Dr. J. A. Keja of the Netherlands built this Graupner Messerschmitt BF-109 as his first foray into semi-scale RC modeling. We're told that, although it's tricky to launch, this Speed 400-powered craft is "certainly a mover!" The nice camouflage finish is thanks to paper and dope covering that was then airbrushed. The Dutch modeler has been bitten by the semi-scale bug; he is also working on a P-51B.



## MIDWEST SPORT FLYER

Ninety-year-old Glen E. Davis of Bradley, IL, submitted this sport flyer to us. Glen, a veteran model airplane builder, certainly came up with a winner this time. The eponymous "Davis" is 46 inches long, has a 56-inch wingspan and was made out of some old wood and sheets of Styrofoam that Glen had in his basement. He notes that it's an excellent flyer. Congrats!





## TRUE-TO-LIFE THUNDERBOLT

Bruno C. Mary of Aurora, CO, went all out on his Top Flite P-47. Modeled after a full-scale Thunderbolt that was stationed in Belgium in 1945, this beauty was fiberglassed with ½-ounce cloth and Z-Poxy. The tail was painted with black MonoKote, the aluminum finish with IMP Skinni-Dip, and the nose art is compliments of Tamiya paints (clear-coated for fuel-proofing). Bruno extended his

Robart struts by ½ inch to accommodate the ¾-inch wheels, which are mounted on Slimline Spring-Air retracts. Even the tailwheel has retracts. For final touches, Bruno added a dummy engine and flaps, a scale cockpit and even a scale exhaust system!

## OH, WHAT A FEELING!

Modeled after the full-scale Toyota airshow team plane in France, this 33-percent-scale Pirate Models 300L was built by Randy Martin of Pasadena, TX. A 3W-100 engine provides this aerobat with its power, and an Airtronics Stylus radio transmits the control inputs. In case you're curious, the full-scale F4 in the background belongs to retired Colonel Steven Richey, who uses it for airshows and public relations.



## SCRATCH-BUILT S.E.-5A

The drawings and photographs in "Scale Aircraft Drawings" Volume 1 were the source for this S.E.-5A. Built by Dave Schwarzen of Festus, MO, this model took about a year to complete. It's powered by a Magnum .91 4-stroke and has a steerable tailskid and a scale bungee on the landing gear. The top and bottom of the cowl are removable to allow easy access to the engine compartment.

## THE FRENCH CONNECTION

The Dewoitine 338 was a French airliner from the late 1930s. Jerry Holcomb scratch-built this model of it and covered it with a paper skin—a process developed by Vance Mosher. Using two M.E.C. Turbo 10 electric motors and powered by 10 cells, this 96-inch-span, 13-pound craft is said to be a beautiful flyer. After all, when it looks so nice, it has to fly well.



## RISING SON

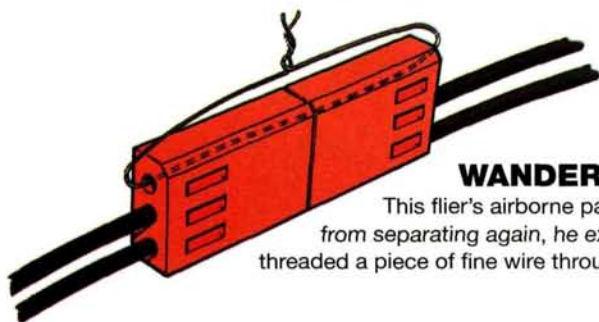
Sal Cavagna's son, also named Sal, stands here with his dad's Mitsubishi "Claude" A5M. This Japanese warbird was scratch-built and, with its G62 powerplant, has a flying weight of 26 pounds. To complete this model's scale look, Sal fabricated his own cowl, wheel pants and canopy in his Holbrook, NY, workshop. As you can see, its 96-inch wingspan easily dwarfs little Sal.



# HINTS & KINKS

BY JIM NEWMAN

**SEND IN YOUR IDEAS.** Model Airplane News will give a free one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Hints & Kinks." Send a rough sketch to Jim Newman c/o Model Airplane News, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can't acknowledge each one, nor can we return unused material.



## WANDERING NI-CDs

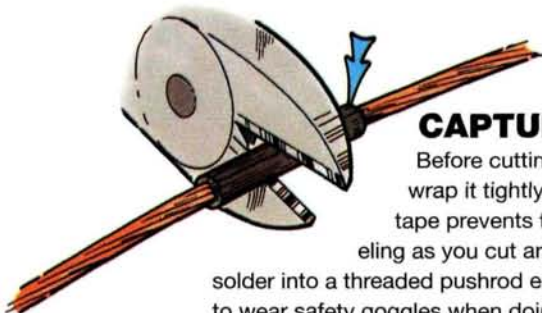
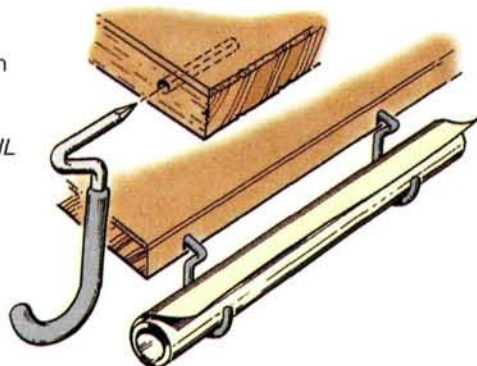
This flier's airborne pack became unplugged, with predictable results. To prevent his connectors from separating again, he extracted the unused pin and socket from the molded plastic housings, threaded a piece of fine wire through the vacant holes and secured the plugs with a couple of twists.

*Keith Abbott, San Diego, CA*

## ON A ROLL

To prevent your covering film from unrolling across the bench and onto the floor, drill a couple of close-fitting holes in the front or side edge of the bench top, then tap in a pair of plastic-coated tool hooks. Your covering will now remain in place on the hooks.

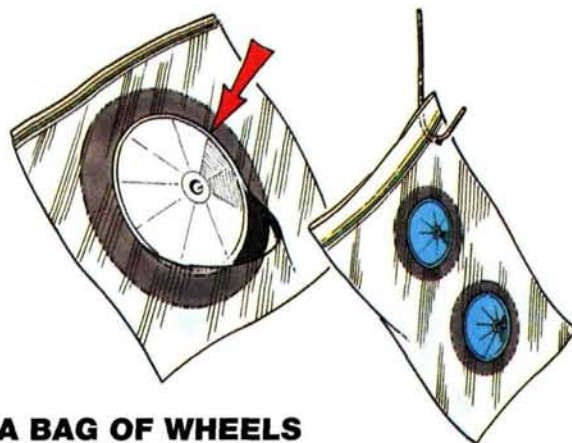
*Darwin Eversizer, Mascoutah, IL*



## CAPTURED ON TAPE

Before cutting steel control cable, wrap it tightly with masking tape. The tape prevents the strands from unraveling as you cut and makes them easier to solder into a threaded pushrod end. Remember always to wear safety goggles when doing any cutting.

*John Clarke, Ft. Wayne, IN*



## A BAG OF WHEELS

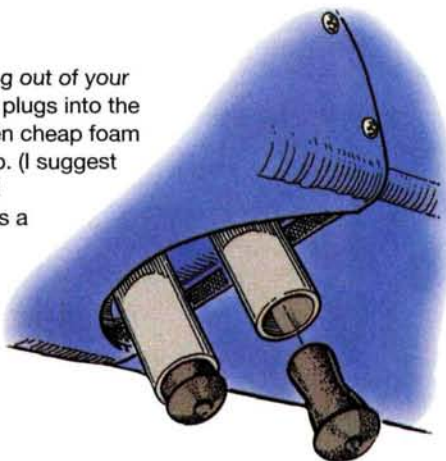
A simple way to mask wheels before you paint them is to slip them into a large, zip-type plastic bag. In each side of the bag, cut a hole that's slightly smaller than the wheel hub, then tuck the plastic behind each rim on both sides of the bag. Spray the wheel centers, then hang the bag on a hook until both sides have dried.

*Daren Savage, Laguna Niguel, CA*

## PLUG PITTS PIPE

Prevent oil from dripping out of your muffler by inserting ear plugs into the end of the exhaust; even cheap foam plugs will do a good job. (I suggest adding a prominent red streamer to the plugs as a reminder to remove them before you try to start your engine.)

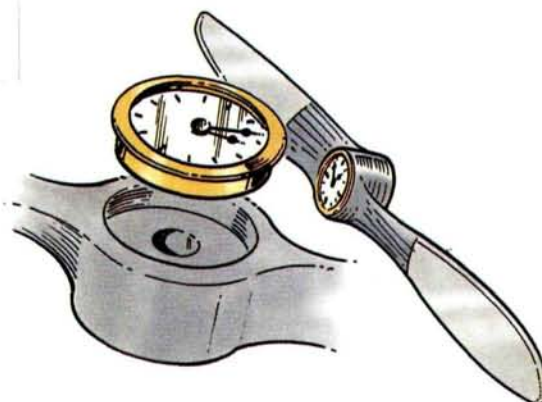
*Dan Fiasconaro, Hamden, CT*



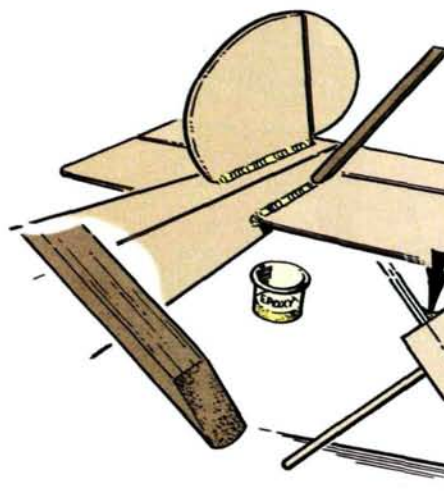
## ONE MAN'S TRASH

Larry retrieved this slightly damaged, giant-scale propeller from the trash, repaired and refinished it, bored out the center and installed a 36mm clock, thereby creating a beautiful timepiece for his desk or wall.

*Larry Renger, Cerritos, CA*







## CAULK THE CORNERS

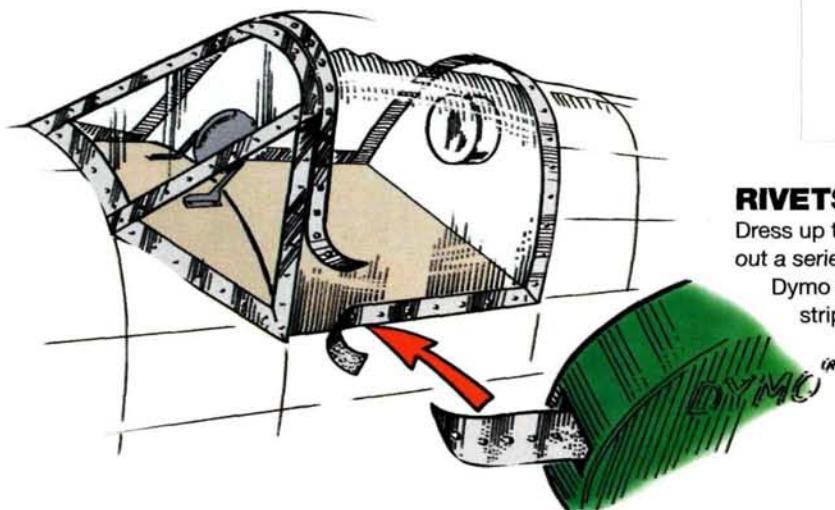
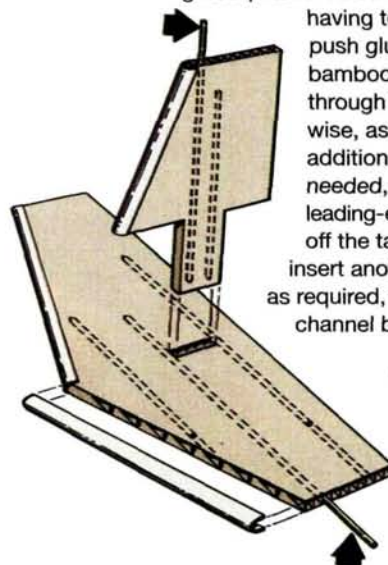
After covering his model's components with film and assembling them, this builder uses a small fillet of epoxy applied with a chisel-shaped piece of wood to seal oil out of the fuselage, fin and stabilizer joints. To make the job easier, he tilts the fuselage 45 degrees while the slow-setting epoxy flows out.

*Ronald Walters, Springfield, MO*

## SKEWERED TAILS

You can strengthen cracked, corrugated-plastic tail surfaces without having to remove them; push glue-coated bamboo skewers through them span-wise, as shown. If additional skewers are needed, pull the leading-edge molding off the tail surface and insert another one or two as required, then glue the channel back into place.

*Richard Bond, Valencia, Spain*



## RIVETS ON TAPE

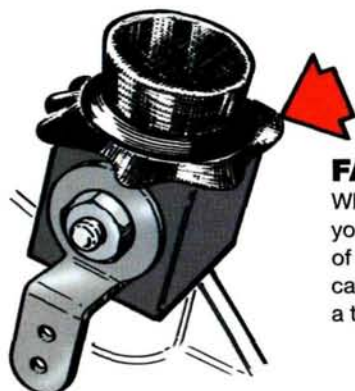
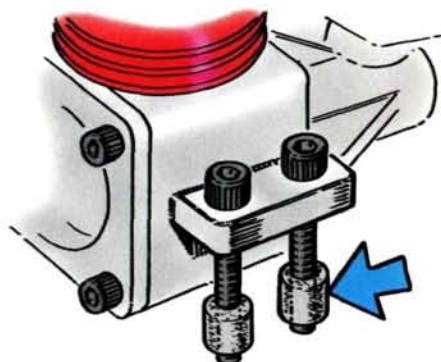
Dress up that canopy with rivets produced by printing out a series of dots (periods) on the tape from a Dymo or other brand of label-making gun. Lay the strips of tape on a piece of glass, then use a steel ruler and sharp knife to trim them before applying them around the canopy.

*George Poirier, Providence, RI*

## CAPTIVE SCREWS

If you remove your engine, especially at the field, capture the mounting screws with rings of fuel line so you don't lose them.

*Aaron Fackler, Princeton, NJ*



## FASHIONABLE FILTER

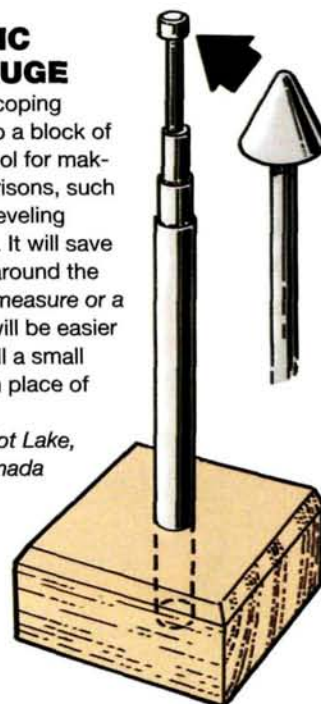
When your field is particularly dusty or gritty, you can quickly make an air filter with a couple of layers of pantyhose secured around the carburetor venturi with a tight-fitting O-ring or a twist of soft wire.

*Eldio Gomes and Jim Frater, Herndon, VA*

## ELECTRONIC HEIGHT GAUGE

A discarded telescoping antenna glued into a block of wood is a great tool for making height comparisons, such as when you are leveling wings in the shop. It will save you several trips around the table with a tape measure or a ruler. The gauge will be easier to use if you install a small cone on the top in place of the flat button.

*Ted Duquette, Elliot Lake, Ontario, Canada*





# RC Models of by Geoff Cozine THE GREAT WAR

**"T**he Great War," as WW I was once known, was intended to be "the war to end all wars." As history has shown, however, we were unable to accomplish this ideal, but we did see a new dimension added to military conflict: the air war. The first airplane had been flown successfully only 11 years before the start of WW I, so designs were crude, and top speeds were slow. Nevertheless, the airplane added complexity to battle, and its wartime use accelerated the airplane's development immensely. Airplanes have greatly benefited both humankind and military strategy, and our hobby would be nearly nonexistent if not for these original warbirds.

American ace Eddie

Rickenbacker flew his Spad XIII and Nieuport 28 to become the United States' top fighter pilot of the WW I era. On the other side of the lines, Germany's Manfred von Richthofen (the "Red Baron"), in his Albatros D-III and Fokker Dr.1, became ingrained in the public's consciousness; so much so that even Snoopy has battled him. These were not the soldiers of today's warfare; rather, they were chivalrous knights who behaved as gentlemen on the battlefield.

The odd combination of complexity and simplicity that these old warbirds have provides RC modelers with a wide variety of building options. In their simplest form, many WW I craft were merely a set of wheels, a fuselage and a wing (or two or three). Those who wish to invest time in their work, however, can spend countless hours on details such as wire riggings, paint schemes, etc., to make a model that anyone would be proud to fly.

Because aviation engineering was still in its infancy, many of these airplanes were unique inventions; designers who wanted better aerodynamics or faster top speeds had few existing designs to examine or borrow







Proctor Enterprises offers a wide variety of kits for the WW I-minded. This Curtiss JN4-D2 Jenny is from their own line of highly detailed models, but they also carry VK Models and Hutson kits.

## History comes alive!



Balsa USA's line of WW I airplanes is mostly available in two sizes. This 1913 Etrich Taube takes a .90 2-stroke, but a .40 size can also be purchased.



Far left: Arizona Model Aircrafts focuses primarily on early aircraft. Their large line of RC WW I kits, such as this deHavilland DH-1a, can be bought unbuilt, partially built, or fully built. Although 1/3, 1/4 and 1/6 scales are the primary sizes of their products, other scales can be produced by special request. Electric versions are also available for certain models.

Inset left: this Fokker D-VII is available from JB Models and is intended for gasoline engines. They also produce a Fokker D-VIII and a Junkers CL-1.

Near left: 3 Sea Bees specializes in RC model aircraft from the early years of aviation, such as this 1914 Morane Saulnier Type L. Most of their ARFs and ARCs are available with your choice of glow, electric, or gas. Museum-quality versions are also available.

Left: Glenn Torrance Models' 1/4-scale Fokkers (this Dr.1, and also their D-VIII) take either a 1.60 twin 4-stroke glow or a gasoline engine.



# RC Models of THE GREAT WAR

ideas from. This is why there are a great number of completely different plan-forms from which to choose. The Taube's majestic, bird-like silhouette shows how closely the designer's thoughts reflected the animal kingdom. With its impressive visage, the Fokker Dr.1 looked like a warrior. The advent of monoplanes and all-metal aircraft paved the way for the future of flying machines. All of the Great War's planes were impressive. Each has a story; each was a first. It's no wonder so many fliers are enamored with them.

To make the WW I RC enthusiast's dreams a reality, the correct accessories and documentation must be acquired to go along with a kit or a set of plans.



For the WW I enthusiast, a Fokker D-VII and this S.E. 5A, both designed by Rich Uravitch, are offered by Hobby Hangar.

COMAPNY AND MODEL	TYPE	SCALE	CONTRUCTION	WINGSPAN (IN.)	LENGTH (IN.)	WEIGHT
<b>3 Sea Bees</b>						
1914 Morane Saulnier Type L	ARF/ARC	1/8	wood	87	54	9 lb., 2 oz.
1914 Pfalz E-I/E-II	ARF/ARC	1/8	wood	72	54	8 lb.
1916 Nieuport 17-C	ARF/ARC	1/8	wood	66	46	8 lb., 6 oz.
1917 Bristol F2B (Bristfit)	ARF/ARC	1/8	wood	94	63	16 lb.
1917 Thomas Morse Scout S4-C	ARF/ARC	1/8	wood	63.6	47.5	9 lb.
1917 Thulin K	ARF/ARC	1/8	wood	70.8	54.3	7 lb., 14 oz.
Albatros C-1	ARF/ARC	1/8	wood	103	63.8	16 lb., 1 oz.
Fokker D-V	ARF/ARC	1/8	wood	68.9	47.6	9 lb., 5 oz.
RAF BE 2C	ARF/ARC	1/8	wood	88.4	65.4	13 lb., 8 oz.
Spad XIII	ARF/ARC	1/8	wood	68.9	47	11 lb., 5 oz.
<b>Aeroplane Works</b>						
Rich Uravitch's Fokker D-VII	kit	1/8	wood	75	58	14 to 18 lb.
Rich Uravitch's S.E. 5A	kit	1/8	wood	73	60	15 to 19 lb.
Ron Weiss's Fokker D-VIII	kit	1/8	wood	111	74	26 to 29 lb.
Ziroli's Fokker Dr.1	kit	2.7 in.=1 ft.	wood	63	52	12 to 16 lb.
<b>Arizona Model Aircrafters*</b>						
Albatros C-III	kit	1/8 to 1/4	wood	76 to 153	42 to 85	varies
Albatros D-II (designed from full-scale plans)	kit	1/8 to 1/4	wood	56 to 111	48 to 96	varies
Albatros D-III	kit	1/8 to 1/4	wood	56 to 111	48 to 96	varies
Albatros D-Va	kit	1/8 to 1/4	wood	56 to 111	48 to 96	varies
Albatros W-4	kit	1/8 to 1/4	wood	56 to 111	48 to 96	varies
Aviatik Berg Scout 30.40	kit	1/8 to 1/4	wood	48 to 96	35 to 69	varies
deHavilland DH-1a	kit	1/8 to 1/4	wood	83 to 163	57 to 115	varies
Dornier Zeppelin D-I	kit	1/8 to 1/4	wood	51 to 102	42 to 84	varies
Fokker Dr.1 (designed from full-scale plans)	kit	1/8 to 1/4	wood, aluminum	47 to 94	36 to 72	varies
Fokker D-VII	kit	1/8 to 1/4	wood	58 to 117	43 to 86	varies
Fokker D-VIII EV 155/18	kit	1/8 to 1/4	wood	55 to 111	38 to 76	varies
Fokker E-III	kit	1/8 to 1/4	wood	66 to 133	46 to 92	varies
Focke Wulf Fw 56	kit	1/8 to 1/4	wood	70 to 140	51 to 103	varies
Hansa Brandenburg C-1	kit	1/8 to 1/4	wood	78 to 156	52 to 104	varies
Junkers J.2 E 252/16	kit	1/8 to 1/4	wood	72 to 144	48 to 95	varies
Nieuport 24 (designed from full-scale plans)	kit	1/8 to 1/4	wood	54 to 107	38 to 75	varies
Nieuport 27 (designed from full-scale plans)	kit	1/8 to 1/4	wood	54 to 107	38 to 75	varies
Pfalz D-IIIa 17	kit	1/8 to 1/4	wood	62 to 123	46 to 92	varies
Pfalz D-XII	kit	1/8 to 1/4	wood	55 to 110	43 to 85	varies
RWD-8 Polish Trainer	kit	1/8 to 1/4	wood	70 to 140	47 to 94	varies
Sopwith Swallow	kit	1/8 to 1/4	wood	58 to 115	37 to 74	varies
Spad XIII	kit	1/8 to 1/4	wood	53 to 105	41 to 82	varies
Zeppelin C-II	kit	1/8 to 1/4	wood	79 to 157	53 to 106	varies
<b>Balsa USA</b>						
1/8-scale Sopwith Pup	kit	1/8	wood	108	77	29 lb.
1/4-scale Sopwith Pup	kit	1/4	wood	77	53	12 1/2 lb.
1913 Etrich Taube 40	kit	1/8	wood	62	44	5 lb.
1913 Etrich Taube 90	kit	about 1/8	wood	83 1/2	63 1/2	8 to 8 1/2 lb.
Bristol M-1	kit	about 1/8	wood	60	44 1/2	6 to 6 1/2 lb.
Fokker E-III Eindecker 40	kit	about 1/8	wood	60	42 1/2	5 1/2 lb.
Fokker E-III Eindecker 90	kit	1/8	wood	80	56 1/2	7 1/2 lb.
<b>Dare Design and Engineering</b>						
Curtiss JN-4D Jenny	kit	1/12	wood	43	26	12 to 13 oz.
Fokker D-VIII	kit	1/7	wood	45	33	19 1/2 oz.
Fokker Dr.1 Triplane	kit	1/9	wood	31.25	26	18 3/4 oz.
Nieuport 17	kit	1/4	wood	68	48	6 1/2 to 7 lb.
Sopwith Camel	kit	1/8	wood	42	27	26 1/2 oz.
Sopwith Triplane	kit	1/9	wood	35.2	27	19 oz.

\* The manufacturer feels that weight and power figures vary greatly between models and modelers, so no definitive numbers are available.



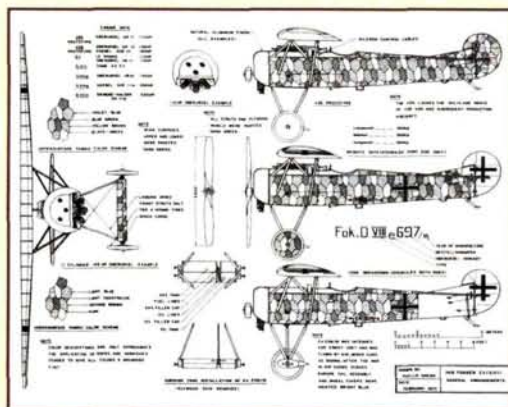
**This brightly colored Albatros D-II is one of FunAero R/C's .60-size, 2-stroke models. Their WW I line also includes an S.E. 5A.**



## Research, Research, Research

One major thing separates a sport-scale RC model from a Rhinebeck-winning masterpiece: detail. How can you find out how the cockpit of your Fokker D-VII looked? Which British ace did your S.E. 5A belong to? How are you going to build that rare

WW I warbird if no one offers plans? Documentation and 3-views are the only way to find these answers. Of course, a few trips to a museum or an Internet search can help, but trips take time, and the Internet isn't always as reliable as we'd like it to be. Also, to compete in a scale event, you're going to need a detailed documentation package that



outlines every rivet and flying wire. Why spend your time searching museums or combing the Web? Go to a company that offers documentation packages and 3-views, and all of the work is done for you. The following sources may have more than you can find elsewhere, and they just might have the elusive information you need on your favorite, rare craft:

- **Albatros Productions Ltd.**  
documentation packages
- **Aviation Heritage** 3-views, photos, research packages
- **Bob Bank's Scale Model Research**  
3-views, in-depth photo and documentation packages
- **Model Airplane News**  
"Scale Aircraft Drawings, Volume I"
- **Replicraft** full structure 5-views taken from factory drawings, 1/5-scale drawings, documentation packages
- **Schiffer Publishing** research books
- **Squadron/Signal Publications**  
documentation packages
- **WW I Aeroplanes Inc.** 3-views, documentation packages, photos, articles

POWER REQUIRED	ACCESSORIES AVAILABLE?	PRICE
.60 2-stroke; .80 to .90 4-stroke	Y	\$695/\$520
.46 to .60 2-stroke; .60 to .80 4-stroke	Y	\$585/\$495
.46 to .60 2-stroke; .60 to .90 4-stroke	Y	\$725/\$545
.80 to .90 2-stroke; .90 to 1.20 4-stroke; G23	Y	\$949/call
.56 to .70 2-stroke; .80 to .90 4-stroke	Y	\$725/\$545
.46 to .62 2-stroke; .60 to .80 4-stroke	Y	\$585/\$495
.60 to .90 2-stroke; .90 to 1.20 4-stroke	Y	\$949/call
.46 to .60 2-stroke; .60 to .90 4-stroke	Y	\$749/call
.60 to .90 2-stroke; .90 to 1.20 4-stroke	Y	\$929/call
.60 to .75 2-stroke; .80 to .90 4-stroke	Y	\$749/\$575
.90 to 1.08 2-stroke; 1.20 4-stroke; 2.2ci gas	N	\$300
.90 to 1.08 2-stroke; 1.20 4-stroke; 2.2ci gas	N	\$300
3.7ci gas	N	\$400
35 to 42cc gas	N	\$350
varies	Y	\$395 to \$900
varies	Y	\$375 to \$900
varies	Y	\$375 to \$900
varies	Y	\$375 to \$900
varies	Y	\$395 to \$900
varies	Y	\$375 to \$995
varies	Y	\$750 to \$1150
varies	Y	\$425 to \$1100
varies	Y	\$425 to \$1050
varies	Y	\$325 to \$725
varies	Y	\$375 to \$950
varies	Y	\$375 to \$900
varies	Y	\$425 to call
varies	Y	\$750 to \$1150
varies	Y	\$500 to \$1150
varies	Y	\$375 to \$995
varies	Y	\$375 to \$995
varies	Y	\$375 to \$900
varies	Y	\$375 to \$900
varies	Y	\$375 to \$1100
varies	Y	\$375 to \$900
varies	Y	call to \$1100
varies	Y	\$425 to \$1050
2.7 and up 4-stroke	Y	\$269.95
1.20 4-stroke; G23	Y	Available soon
.30 to .46 2-stroke; .40 to .50 4-stroke	Y	\$54.95
.70 to .91 2-stroke; .60 to .80 4-stroke	Y	\$129.95
.40 to .60 2-stroke; .46 to .90 4-stroke	Y	\$64.95
.40 to .46 2-stroke; .45 to .61 4-stroke	Y	\$81.95
.46 to .61 2-stroke; .61 to .91 4-stroke	Y	\$119.95

Geared Speed 400; .049 2-stroke	N	\$59.95
Geared Speed 400	N	\$54.95
Geared Speed 400; .049 2-stroke	N	\$59.95
.53 to .64 4-stroke	N	Available soon
Geared Speed 400; .061 to .09 2-stroke	N	Available soon
Geared Speed 400; .049 2-stroke	N	\$59.95



**Hobby Lobby offers a number of Simprop slow flyers, including this Spad S13 as well as the Pfalz D-III and Fokker Dr.1. Powered with Speed 280 motors and built mostly of foam, these kits may satisfy both your slow-flyer and WW I needs.**



## Finishing Touches

Oftentimes, a modeler doesn't need an entire kit. Maybe plans are already in hand, and all that's needed is the perfect set of scale wheels or a machine gun. Maybe the search is for a suitable pilot, the right shade of green paint, or a near-perfect replica of an instrument panel. Many companies do offer accessories, but if you're trying to find that last piece for your Scale Masters-winning model, take a look at this list of companies, too. They may not sell complete kits, i.e., instructions, wood, plastic parts, plans, etc., in one package, but they do sell any number of scale accessories that could be just the thing you're looking for.



**Williams Bros.** is just one of the companies that offers a large line of machine gun and mock engine kits as well as wheels and pilot figures for your WW I masterpiece.

<b>Aeroloft Designs</b>	decals
<b>Arizona Model Aircrafters</b>	wheels, guns, ammunition, instrument panels, cowls, gauges, compasses
<b>Bob Holman Plans</b>	short kits (plans and laser-cut wood parts, but no instructions, sticks, sheeting, music wire or accessories), cowls, plans, wheels, guns, ammo, mock radial engines, etc.
<b>Clark Industries Aircraft</b>	scale props, Clark Gypsy Minor engine; may offer kits in the future
<b>Fiberglass Specialties</b>	cowls
<b>Global Hobby Distributors</b>	wheels
<b>Hangar 9</b>	pilots
<b>Hobby Supply South</b>	decals, pilots, floats, guns
<b>J'Tec</b>	instrument set, mufflers
<b>Major Decals</b>	decals
<b>MGA Enterprises</b>	pilots
<b>Model Graphics</b>	decals
<b>Nelson Aircraft Co.</b>	custom WW I paints, 1/5-, 1/4- and 1/3-scale instrument panels, flying wires, miniature screws

COMAPNY AND MODEL	TYPE	SCALE	CONTRUCTION	WINGSPAN (IN.)	LENGTH (IN.)	WEIGHT
<b>FunAero R/C</b>						
Albatros DIII	kit	1/5	wood	60	51	10 to 11 lb.
S.E. 5A	kit	1/5	wood	60	48	9 to 10 lb.
<b>Glenn Torrance Models</b>						
Fokker D-VIII	kit	1/4	wood	83	57	16 lb.
Fokker Dr.1	kit	1/4	wood	71	57	16 lb.
<b>Hobby Hangar</b>						
Fokker D-VII	kit	1/7	wood	51	41	4 3/4 to 5 1/4 lb.
S.E. 5	kit	1/7	wood	50	40	4 3/4 to 5 1/4 lb.
<b>Hobby Lobby</b>						
Simprop Fokker Dr.1 Triplane Slow flyer	ARF	N/A	foam, wood	28	23	14 oz.
Simprop Pfalz D-III Biplane Slow flyer	ARF	N/A	foam, wood	36	27 1/2	11 oz.
Simprop Spad S.1.3 Biplane Slow flyer	ARF	N/A	foam, wood	31	24 1/2	11 oz.
<b>Hobby Supply South</b>						
Flair Baronette (Sport Fokker Dr.1)	kit	1/6	wood	49	40	5 lb.
Flair Etrich Taube	kit	1/7	wood	80	48	5 1/2 lb.
Flair Fokker D-VII	kit	1/6	wood	61	48	8 lb.
Flair Fokker Dr.1	kit	1/4	wood	73	58	13 lb.
Flair Legionaire (Sport Nieuport 17)	kit	1/6	wood	52	40	5 lb.
Flair Puppeteer (Sport Sopwith Pup)	kit	1/6	wood	60	47	7 lb.
Flair S.E. 5A	kit	1/6	wood	51	39	6 lb.
<b>Ikanus (available through R/C Direct)</b>						
Bleriot III Slo-Flyer	ARF	N/A	aluminum, carbon, foam	49 3/8	-	9.8 oz.
Grade Eindecker Slo-Flyer	ARF	N/A	aluminum, carbon, foam	43 1/2	-	9.8 oz.
Rumpler Taube Park-Flyer	ARF	N/A	carbon, foam	47 1/4	-	12.3 oz.
<b>JB Models</b>						
Fokker D-VII	kit	1/5	wood	72	56	14 to 16 lb.
Fokker D-VIII	kit	1/3	wood	111	72	28 lb.
Junkers CL-1	kit	1/6	wood	80	54	8 to 10 lb.
<b>Proctor Enterprises</b>						
Albatros DVA	kit	1/4	wood	89	73	20 lb.
Curtiss JN4-D2 Jenny	kit	1/6	wood	87.25	54.65	11 lb.
Fokker D-VII	kit	1/4	wood	88 and 69	69	23 lb.
Fokker E-III Eindecker	kit	1/4	wood	100	70	15 to 20 lb.
Nieuport 11	kit	1/5	wood	61.25	47.50	7.5 lb.
Nieuport 28 C-1	kit	1/4	wood	80	63.75	16.5 lb.
Hutson RAF S.E. 5A (1/5 elec. and gas avail.)	kit	1/4	wood, fiberglass	73	57	14 lb.
Hutson Hanriot HD-1	kit	1/4	wood, fiberglass	85.5	57	15 to 16 lb.
VK Models Fokker Dr.1	kit	1/6	wood	47	37	5.25 lb.
VK Models Sopwith F-1 Camel	kit	1/6	wood	56	36.25	6 lb.
VK Models Nieuport 17	kit	1/6	wood	54	37	5.5 lb.
VK Models Sopwith 1 1/2 "Strutter"	kit	1/6	wood	67.5	51.5	9 to 10 lb.
<b>Synthesis Unlimited</b>						
Bristol Scout	kit	1/12	wood	24	22	4 1/4 oz.
deHavilland DH-2	kit	1/12	wood	28	20	4 1/2 oz.

\* The manufacturer feels that weight and power figures vary greatly between models and modelers, so no definitive numbers are available.



Rich Uravitch offers his line of "Plans and Plastics," including this Fokker D-VII. He offers plans, instructions and vacuum-formed parts for a number of his WW I models.



If you're looking for functional radial engines, this Technopower II Inc. model may be the one for you. If not, they offer many others, as do Seidel, Saito, Robart and O.S.



Clark Industries provides Proctor Enterprises and Glenn Torrance Models with laminated scale props, and they also sell them directly, along with a line of sport props. The prop decals are available through Proctor.

Officers and Gentlemen  
O.S. Engines  
Pilots by Diane  
Precision Fiberglass Products Co.  
Proctor Enterprises

Reid's Quality Model Products  
Rich Uravitch

Robart  
Saito  
Seidel  
Technopower II Inc.  
Williams Bros.

pilots  
radial engines  
pilots  
cowls  
wheels, guns, pilots, decals, engines, flying wires, scale props, dummy engines, etc.  
7½- and 10½-inch wheels  
plans with illustrated instruction manuals, vacuum-formed parts (cowls, wheel pants, headrests, panels, etc.)  
radial engines  
radial engines  
radial engines  
radial engines  
wheels, pilots, machine guns, mock radial engines

POWER REQUIRED	ACCESSORIES AVAILABLE?	PRICE
.60 and up 2-stroke; .70 to .91 4-stroke	Y	\$174.95
.60 and up 2-stroke; .70 to .91 4-stroke	Y	\$159.95
1.60 twin 4-stroke; Q35	Y	Available soon
1.60 twin 4-stroke; Q35	Y	\$512
.40 to .46 2-stroke; .45 to .61 4-stroke	Y	\$94.99
.40 to .60 2-stroke; .45 to .61 4-stroke	Y	\$94.99
Speed 280	N	\$109
Speed 280	N	\$99
Speed 280	N	\$99
25 to .40 2-stroke; .40 to .70 4-stroke	Y	\$144.95
20 to .35 2-stroke; .30 to .40 4-stroke	Y	\$169.95
40 to .60 2-stroke; .48 to .80 4-stroke	Y	\$179.95
90 to 2.00 2-stroke; .90 to 1.80 4-stroke; G23	Y	\$299.95
25 to .40 2-stroke; .40 to .70 4-stroke	Y	\$144.95
28 to .50 2-stroke; .40 to .70 4-stroke	Y	\$159.95
35 to .40 2-stroke; .40 to .70 4-stroke	Y	\$149.95
Speed 280	Y	\$59.95
Speed 280	Y	\$59.95
Speed 280	Y	\$69.95
3-38, Q-42	Y	\$225
3-62, Q-65	Y	\$450
90 to 1.20 4-stroke	N	\$175
2.4 to 3.0ci V-twin	Y	\$895
70 to .80 4-stroke	Y	\$649
2.00 and up 4-stroke	Y	\$769.95
1.50 and up 4-stroke	Y	\$549.95
70 to .80 4-stroke	Y	\$398.95
1.60 and up 4-stroke	Y	\$549.95
1.20 to 1.50 4-stroke	Y	\$689.95
1.80 4-stroke	Y	\$689.95
48 to .70 2- or 4-stroke	Y	\$209.95
48 to .70 2- or 4-stroke	Y	\$209.95
48 to .70 2- or 4-stroke	Y	\$209.95
48 to .70 2- or 4-stroke	Y	\$298.95
Seared DC5 2.4	N	\$49.95
Seared DC5 2.4	N	\$54.95

## Custom-Made Kits

For those who prefer the hands-on, scratch-building approach but don't have the time or experience to cut out all the parts, there is a solution: kit cutters (listed below). Some of the manufacturers listed elsewhere do offer kit-cutting services, but some deal solely in this field. Some offer a collection of hundreds of plans drawn by the most popular model designers, while others are willing to take any set of plans and cut a kit for it.

All-American Kit Cutters  
Arizona Model Aircrafters  
Klarich Custom Kits  
Precision Cut Kits



The Puppeteer, Flair's sport-scale version of the Nieuport 17, is available—along with the rest of the Flair WW I line—through Hobby Supply South.





**Synthesis Unlimited sells two balsa-wood park/indoor flyers—this Bristol Scout and a deHavilland DH-2. Weighing 120 to 125 grams (roughly 4¼ to 4½ ounces), they are the lightest in this survey.**

## Rhinebeck WW I Jamboree

If you're looking for a place to compete with your WW I warbird or just take a look at others' planes for ideas and inspiration, check out the Annual Rhinebeck WW I Jamboree. Each September for the past 33 years, the folks in the Mid-Hudson RC Society have hosted this event at the Old Rhinebeck Aerodrome. As the only nationally known, exclusively World War I event, Rhinebeck brings modelers from all over the United States and beyond to show off and compete with their creations.



If it's the middle of May, and you don't want to wait until September to travel to Old Rhinebeck, don't let that stop you. There is a museum complete with restored, airworthy aircraft for you to marvel at and flying shows for you to enjoy every weekend from June to October.

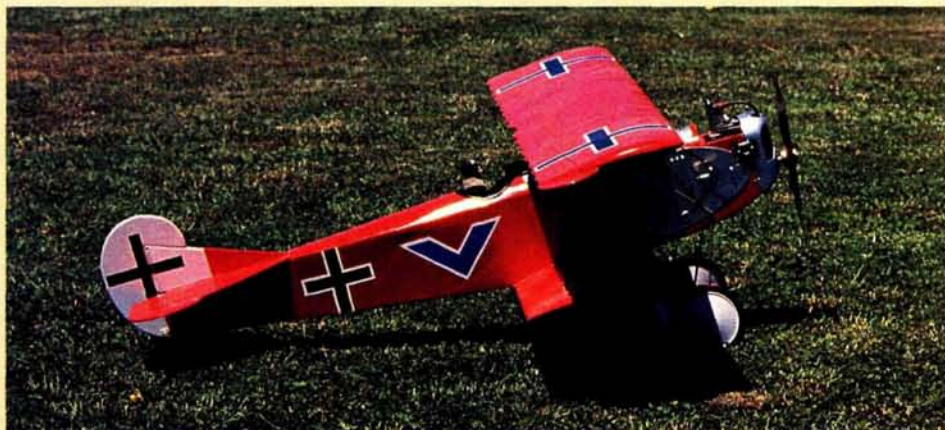
So if the Smithsonian (or your local museum) doesn't have enough WW I aircraft for you, then check out the Old Rhinebeck Aerodrome and immerse yourself in the dawn of the warbird.

That's where we come in: this article is a source guide for those modelers who have had trouble finding that perfect model or part. To provide modelers with what they need, kits, plans, documenta-

tion, accessories and kit-cutting sources are all listed here.

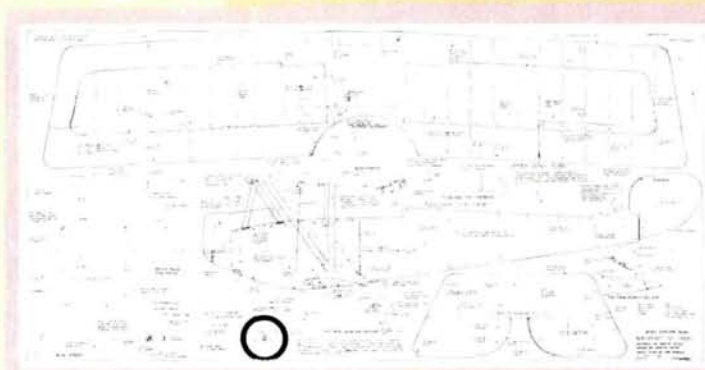
Companies listed in the kits chart may also offer plans, accessories, custom wood cutting and documentation. Those

**The Rich Uravitch-designed Fokker D-VII is one of the kits that Aeroplane Works has for the fan of the Great War's aircraft. Ron Weiss' Fokker D-VIII, Zirol's Fokker Dr.1 and Uravitch's S.E. 5A are also available.**



included under the plans listing may offer one WW I RC plan, or they may offer hundreds. Contact phone numbers, addresses and website addresses for all the companies are listed in the "Index of Manufacturers" in the back of this issue. Moreover, this survey is limited to RC World War I planes. The kits and plans listed here require no adjustment for RC flight.

Whether you dream of a time when people could remember—or might even have met—the Wright brothers; if you want a simple design to get started, or a complex design to challenge your modeling skills; or if you're simply a WW I enthusiast, the information provided here is a must-have. Enjoy yourself as



## The Kit Alternative

If you have a unique subject in mind for your WW I masterpiece, but it hasn't been kitted, building your model with plans is a way to get what you want. Even if your plane is not unique, choosing which accessories, hardware, covering, etc., that you'll use on it may be worth the extra building time. There are many RC WW I plans sources for modelers; some are even able to enlarge or reduce their plans so you'll have a choice of scales. Again, many companies that produce kits and accessories also sell plans. The following companies specialize in RC WW I plans.

A. A. Lidberg	Jerry Behrens
Airdrome Plans Service	John Pond Old-time Plan Service
Arizona Model Aircrafters	M. C. Beaulieu Plan Service
Bob Holman Plans	Model Airplane News
Charles Yandl	Nick Zirol Plans
Cleveland Model & Supply Co.	Rich Uravitch
Gleason Enterprises	Ron Weiss
Gene Falda	Vintage R/C Plans
Jack L. Bale	Walt Moucha Models

you relive the days when manned flight was just beginning and when pilots were little more than knights on a new breed of horse!

*\*The addresses of the companies featured in this guide are listed alphabetically in the Index of Manufacturers on page 134. †*



by David C. Baron

## The buzz of the micro world

**T**he Jonny Bee II is an ARF slow flyer that will really appeal to those who believe that balsa wings fly better. With a configuration that reminds me of the super-stable, rubber-powered free-flight models, this plane offers incredible stability and takes only a few minutes of assembly to get into the air.

## Northeast Sailplane Products

# Jonny Bee II

### ASSEMBLY

Designed by Northeast Sailplane\* and manufactured to a high standard in Eastern Europe, this model is very well built. All the joints are well cut and glued, and there are no apparent gaps—no compromises. Notably, the fuselage is a single carbon-fiber rod that gives the model superior strength and durability while it reduces drag.

• **Covering.** This appears to be the light-weight version of Carl Goldberg's film; it has been very well applied—no wrinkles or warps.

• **Hardware.** A complete set of good-quality pushrods and clevises is provided. The free-flight-style wheels are fine for smooth surfaces,

and although the model wouldn't have any trouble landing in grass, for a better rollout (however short!), I recommend Dave Brown\* 2-inch (at least) wheels.

• **Instructions.** They are short, clear and simple. I was impressed.

• **Radio installation.** The receiver is installed with Velcro®-brand fastener. Be sure to check the CG before you establish the receiver and servo locations. As you can see from the photos, I installed the servos with



### SPECIFICATIONS

**Distributor:** Northeast Sailplane Products

**Type:** parasol/slow flyer

**Wingspan:** 40 in.

**Chord:** 8.25 in.

**Weight:** 8.7 oz.

**Wing area:** 330 sq. in.

**Wing loading:** 3.7 oz./sq. ft.

**Material:** balsa wing and carbon-fiber boom fuse

**Power:** twin Johnson 100-size can motors (included) that both turn the same gear

**Battery:** Sanyo 110mAh, 8-cell, 9.6V, or optional NiMH 8-cell, 270mAh for extended duration

**Speed control:** Kontronik Micro 10

**Prop used:** two types supplied

**No. of channels req'd:** 3

**List price:** \$159.95 (includes airplane, two props, battery and geared power system)



*Pre-assembled, the twin-motor configuration and gearbox offer a great power reserve, and while the urge will be great to add trim before flying the Jonny Bee II, none was necessary.*

and parasol configuration make this design very forgiving.

- **Speed range.** Slow flight is slightly faster than walking speed but comparable with any of the other slow flyers on the

*Although the original black prop gives you longer flights, this blue prop—about 2 inches larger in diameter—is also included and gives you better performance.*

*The underside of the Jonny Bee II. After checking the CG, I installed the servos and receiver with servo tape.*

servo tape, which I prefer to CA because the glue always seems to go everywhere you don't need it, and servo cases need to be roughened before any brand of glue will grab.

Before you attempt to fly the Jonny Bee II, make sure that you have smooth control-rod movement—no binding. To prevent flexing of the pushrod outer covers, I added a brace behind the servos; this improved the centering of the flight surfaces.

- **Motor installation.** The entire motor, gearbox and mount are assembled for you. I was curious about the twin-motor configuration, and now that I have flown the model, I appreciate it. It gives a power reserve that most other "park flyers" do not even come close to having. While the right thrust and downthrust look large, the review model didn't require any trim at all. Resist the urge to change its trim until after you've flown it! I don't think you will ever need to change it!

- **Propeller.** This model has a very ingenious propeller-mounting system. The prop is keyed to the hub, centered with a pin then held in place by rubber bands. This system takes the worry out of grass-field landings, during which these lightweight models typically nose over.

#### FLIGHT PERFORMANCE

- **Preflight considerations.** Even though you checked the CG prior to final assembly, check it again. This model needs only

average control throws and is very responsive, especially to rudder, owing to the tip panels' dihedral angle.

- **Duration.** With the 110mAh, 8-cell pack, the Jonny Bee II seems to have a 7- to 8-minute flight duration. This flight time is for throttled back, indoor flight, but I think that you will be impressed whether you fly indoors or out. Flying at full throttle with the twin motors will give you plenty of climb and zip—probably better than any other stock model in the park-flyer class. Extended full throttle will shorten your flight drastically.

Installing an NiMH battery pushes up the flight time to the 14- to 18-minute range, but this depends on the style of flight (no aerobatics or prolonged full-throttle use!) and the propeller. Although the blue prop, which is about 2 inches larger in diameter, definitely outperforms the original black prop, it does so at the expense of duration at a high throttle setting. For those of limited RC experience, I recommend the blue prop, but anyone with experience who craves duration will be more than happy with the black prop.

- **Taxiing.** Because of the fuselage length, the model taxis very well; we always taxied back from flights in the local gymnasium.

- **Stalls.** Stalls are as gentle as those of any trainer I have ever flown. The dihedral

market. The Jonny Bee II has the edge over some of its foam competitors, as it does not fall off to either side when stalled; it lowers its nose and resumes flight.

- **Aerobatics.** Loops, barrel rolls and spirals are about the limit of the Jonny Bee II's aerobatics capability, but the real fun is in tabletop touch-and-go's and other precision flight games.

- **Landings.** The Jonny Bee II is as easy to land as it is to fly. Keep a bit of power going to the motor, or it will not give you a very long flare.

#### CONCLUSION

This is one of the best-performing slow flyers I have tested. Because of its ease of assembly, durability, traditional balsa wing and tail, superior duration and superior handling in the air, I highly recommend this model.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ✦*

## NiMH Duration Pack

This 8-cell nickel-metal-hydride 270mAh battery pack offered by Northeast Sailplane weighs only a few grams more than the typical 8-cell, 110mAh Ni-Cd pack. Priced at \$34.95, this is the ticket for longer-duration flights for many slow flyers, and this duration advantage comes without any significant weight penalty. In addition, these packs show improved performance after they have been used a few times.


If you call Northeast Sailplane Products to order a pack, tell them we sent you!







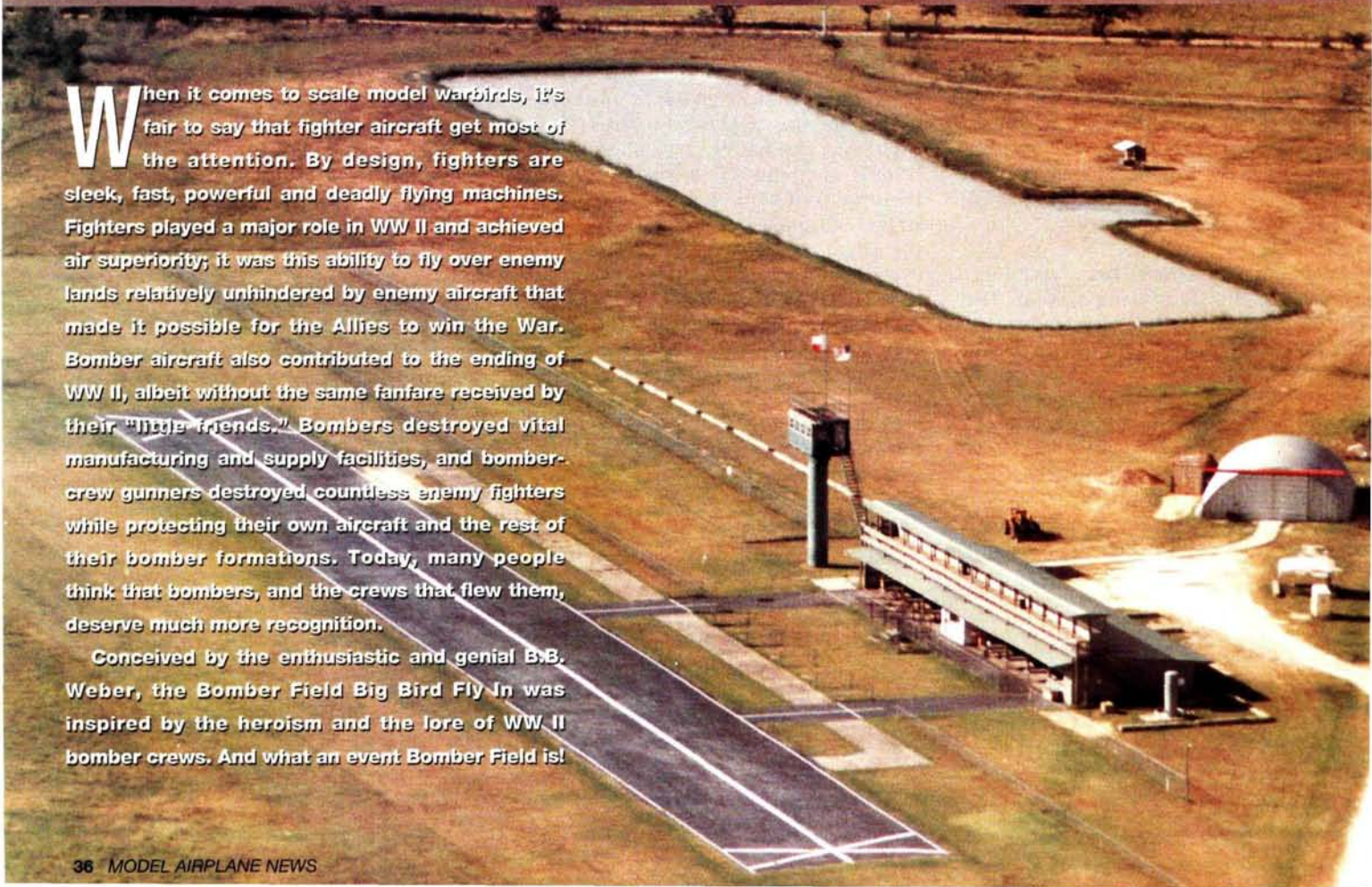




Mike Fabian's Quadra Q-75 powered Messerschmitt 109 comes in for a landing.

The 11<sup>th</sup> Annual *by Gerry Yarrish*

# BOMBER FIELD BIG BIRD



When it comes to scale model warbirds, it's fair to say that fighter aircraft get most of the attention. By design, fighters are sleek, fast, powerful and deadly flying machines. Fighters played a major role in WW II and achieved air superiority; it was this ability to fly over enemy lands relatively unhindered by enemy aircraft that made it possible for the Allies to win the War. Bomber aircraft also contributed to the ending of WW II, albeit without the same fanfare received by their "little friends." Bombers destroyed vital manufacturing and supply facilities, and bomber-crew gunners destroyed countless enemy fighters while protecting their own aircraft and the rest of their bomber formations. Today, many people think that bombers, and the crews that flew them, deserve much more recognition.

Conceived by the enthusiastic and genial B.B. Weber, the Bomber Field Big Bird Fly In was inspired by the heroism and the lore of WW II bomber crews. And what an event Bomber Field is!





# FLY IN



*B.B. Weber's B-17 makes a picture-perfect bombing run.*

**An industrial-strength,  
must-attend event!**



*Above: Tommy Armstrong's impressive B-17 made several flights during the weekend. Tom won this model at the 1994 event. Below: Mike Deblasis flew this 72-inch-span Fokker Dr.1 many times over the weekend. Built from the Flair kit, the triplane is powered by a Quadra 42 gas engine.*



*Built by Jack "Bones" Spears, this impressive Consolidated B-24 Liberator was flown by club president Keith Frederickson. Constructed from the American Eagle kit, the B-24 has a fiberglass fuselage and a built-up wood wing.*



*Left: this Nieuport 17 was flown by Ned Raleigh of Corpus Christi, TX. Built from a Scratch-A-Plane plans package, the French biplane has an 82-inch span and is powered by a Zenoah G-38 gas engine.*





## TEXAS JETS



*The Texas Jets is a "turbine exclusive" organization; the members put on quite a demonstration.*

There is little doubt that model jets occupy the upper edge of the modeling envelope; they only continue to grow in popularity. Equipment such as engines, fan units, radios, servo retracts and, more recently, gas-burning turbines is at such a high level of sophistication and reliability that the only truly difficult part of this hobby is deciding which model to buy. As designs become easier to build and products more foolproof, it's not so much a question whether you'll get involved but rather, when!

A dedicated group of modelers calling themselves the Texas Jets might have pushed the jet-set bar one rung higher when they formed their turbine-exclusive club. Yep! These guys fly only turbine-powered models, and they have a really good time doing it. I believe the Texas Jets is the first such club, and when you witness the "everyday" attitude these guys show when they put their models through their paces, you begin to understand just how down-to-earth turbine technology is becoming. No major hassles trying to get engines to run; no running around with big ground-support units; no half-baked attempts to get airborne; these guys come to fly, and boy, do they ever do that!

Based in Houston, the Texas Jets club members are Rob Gross, Keith Simmons, Jose Rodriguez, Kevin Thoele and Ray Blair. Their squadron is made up of planes built most often from



*This Avons F-15 Strike Eagle flew several sorties during the event.*

Bob Violett Models kits, including an F-86 powered by an AMT Mercury turbine, a T-33, a modified Bandit and two modified Mavericks—the last four powered by RAM 750 power units. Also in the ranks is a beautifully done F-15 Strike Eagle from an Avons kit powered by an AMT turbine. At any flying event, this is a very impressive collection of hardware!

During the Fly In, the club put on several demos, as well as a few formation flights in which three or four jets flew together. If you've ever heard the sound of a model turbine jet engine, you know just how great that sound is. Now, multiply that by three or four and you have Goose-bumps City! Of special note is that, even though the Mavericks were not designed for turbine powerplants, at the time of Bomber Field, the total number of flightson them was 118! Doesn't

## TEXAS HOSPITALITY

Located in Monaville, about 35 miles northwest of Houston, Bomber Field is now in its 11th year and is open to IMAA-legal, military, civilian and sport models; it never fails to draw a large crowd. The Bomber Field facility is a large chunk of Texas real estate, owned by B.B. Weber. While it's not quite in the boondocks, the flying field is far from major population sites and is in no danger of being replaced by condos and urban development.

The main runway is paved and is an impressive 75x600 feet long; an 800-foot grass runway runs parallel to it for antique and tail-dragger aircraft. Adjacent to the runways and roomy pit area is a 150-foot-long pavilion that offers welcome shade and shelter from the Texas-grade sunlight. Elevated above the pavilion is a covered 150x6-foot observation deck lined with benches affording a fantastic view of the runway. Within the pavilion are six, 30-foot workbenches, electric outlets for chargers and tools, overnight storage areas and a snack bar. Towering over the entire complex is a control tower, access to which for safety reasons is by special permission only. Just one visit to this friendly "big bird" hoedown, and you'll surely rate it as one of the very best model airplane events in the country. I certainly did.

As impressive as the facility is, the models that show up each year are equally inspiring. Fighters from both world wars, unlimited aerobatic aircraft, classic civilian airplanes and even turbine-powered jets were there in force. But, as the name implies, the superstars of this event were the bombers. Several B-17s, a B-24, a B-29 (the *Enola Gay*), a couple of B-25 Mitchell bombers and an awesome Tupolev Tu-95 Bear shared center stage. In all, there were 140 registered pilots and more than 250 aircraft at Bomber Field '99.



*Jose Rodriguez flew this RAM 750-powered BVM T-33 several times during the Fly In; it has a beautiful polished aluminum finish with great rivet detail.*

sound as if these guys spend much time on the ground, does it?

The Texas Jets put on a show and opened a lot of eyes in the audience. Looks as though the skies over Texas will be full of contrails from miniature turbines. Gee, I wonder when the first afterburner will come along?



*An AMT turbine-powered BVM F-86 greases in for a landing.*



## A BEAR OF A BOMBER!

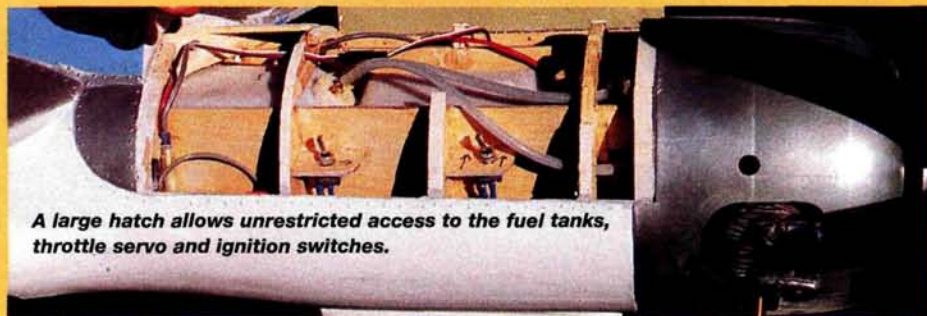
The latest in a long line of ambitious modeling projects, the 1/10-scale Tupolev Tu-95 Bear is B.B. Weber's greatest effort yet. Built from Don Smith plans, the Tu-95 is simply awe-inspiring. The bomber is 18 feet, 7 inches long, 4 feet, 3 inches tall, has a wingspan of 21 feet, 6 inches and weighs 90 pounds. The Bear is of all balsa and ply construction and has 4,000 square inches of wing area; it carries 28 servos, 16 battery packs, eight fuel tanks, 25 electrical switches and three radio systems. B.B. uses a Futaba transmitter and Robart retracts with three separate air systems. Building time was estimated to be eight hours a day for a solid six months! The finish is fiberglass cloth and resin over wood, with Skinny Dip silver powder and adhesive over a primer base. Power is furnished by four, twin-cylinder,



*An overhead view from the observation deck puts the Tu-95's size in perspective.*



*If you look carefully, the steering servo is mounted on the gear just behind the nose wheels.*



*A large hatch allows unrestricted access to the fuel tanks, throttle servo and ignition switches.*

In talking with many of the participants, I discovered that these bomber pilots take great pride in keeping their bombers flying in front of the general public. Where else can you see five or six B-17s fly by in close formation? Next to the full-size Confederate Air Force (also based in Texas), I don't think you'll find this kind of historical airshow anywhere else. Each mission was flown with military precision; safety always remains the prime directive. From super-high and scale-like bombing runs to down-on-the-deck, high-speed flybys, the bombers earned their keep.

### CROWDED SKIES

In between the many military sorties and bombing missions, the skies over Bomber Field were full of all sorts of flying machines. I was very impressed that this military-flavored event welcomed such a wide variety of civilian aircraft. Several well-known modelers were on hand, and everyone enjoyed watching these accomplished pilots put their craft through their paces. From T.O.C.-size unlimited aerobatic planes and gas-powered WW II fighters to colorful Taylorcrafts and Pipers, both sport- and precision-scale models lined the pits. The sheer variety of models was more than I had hoped for; my shutter-finger was very tired by the end of the day.

Bomber Field is a well-run event, and you would be hard-pressed to find an area that needs improving; the only thing that these guys can't control is the weather, but I heard a rumor that they're working on it! Bomber Field is a self-supporting event that doesn't solicit sponsorships; to pay the way, a modest landing and parking fee is charged at the gate. Vendors big and small are always welcome. Contest director Mike Smith, announcers



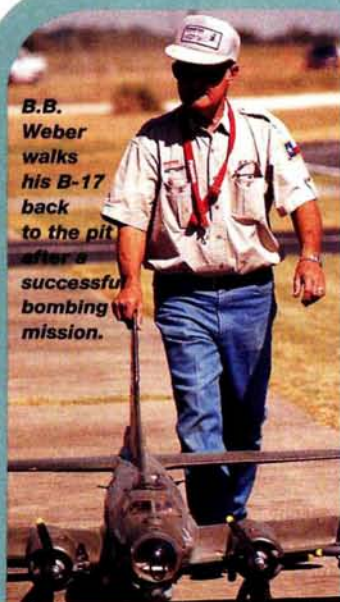
*With a tail fin more than 4 feet high, the Tu-95 is impressive-looking from any angle.*

4-stroke, 1.82ci glow engines. The impressive-looking, 6-blade counter-rotating props on each engine are for static display only. The beautifully made aluminum spinners are from Tru-Turn.

The full-size Bear first flew in late 1954 and entered service in early 1956. The Bear remained in limited production for approximately 35 years. In 1973, because of significant airframe modifications, this long-range intercontinental nuclear bomber was redesignated Tu-142. The Bear has played several roles during its long military career, including carrying nuclear weapons in the form of anti-ship and cruise missiles; it was also used for reconnaissance missions and electronic counter-insurgency deployment. As the counterpart to the United States' Boeing B-52, the Tu-95 certainly ranks as one of the foremost examples of Cold War aviation technology.



## THE MAN BEHIND Bomber Field



B.B. Weber walks his B-17 back to the pit after a successful bombing mission.

B.B. Weber, the man who brought Bomber Field to life, describes himself as an easygoing, farm-raised guy from the south side of Houston. In his childhood, he always loved airplanes; later, he built and flew free-flight models, and when he wasn't busy baling hay, would talk to local military pilots every chance he had. Now retired from the construction industry, 70-year-old B.B. works as a consultant for the business now run by his sons; he considers Bomber Field his main retirement activity.

Always a modeler, B.B. started flying RC in 1975, and between '82 and '83,

worked full-time to develop the Bomber Field concept. In the beginning, B.B. built a B-17 Flying Fortress and then realized that none of the local RC flying fields was big enough for him to safely operate his bomber. To solve this problem, he went out and bought a flat, 50-acre parcel of Texas real estate and put in a paved runway. B.B. happily flew his B-17 there, and then things just began evolving. B.B. did all the work without outside help or sponsors and is generally pleased with the result, as are all those who have come to call Bomber Field their home base.

The Bomber Field organization is made up of about 35 people and puts on two events a year: a warbird meet on the first weekend in June and the Bomber Field Big Bird Fly In during the third weekend in September. B.B. suggests that one of the reasons Bomber Field is so successful is that there are no big egos in the organization. Everyone works hard and works together. With complimentary space for vendors, a huge parking area and some of the best pilots and models in the country, Bomber Field shows no sign of slowing down; it just keeps getting bigger and better. As for the man behind it all, the event speaks volumes about B.B.'s personality and professionalism.

Mike Crotts and Matt Jolley and the rest of the Bomber Field Club members all did a wonderful job in keeping everyone informed and running the event without a hitch. The linemen and safety officials all took their jobs seriously, and everyone came away happy from the 11th annual gathering.

### ALUMINUM OVERCAST

This report wouldn't be complete without my telling you about those great big multiengine masterpieces: the bombers. It was simply impossible to look around and not see at least two bombers parked side by side. Several B-17s flew in formation flights, and at times, there were as many as five Flying Fortresses buzzing the runway. B.B.'s own Fortress, *Shoo Shoo Shoo Baby*, was equipped with four onboard electric starters; with the flick of a switch, his bomber came to life. Most of the B-17s were from the old Westcraft kit and had fiberglass fuselages and foam wing-cores. All the bombers had retracts, flaps and operating bomb-bay doors. Several of the bomber pilots have been coming to the event for many consecutive years, and some travel great

distances. Dwayne Fosseen of Radcliff, IA, travels 1,160 miles to attend Bomber Field and has done so for seven years. His B-17, *Sentimental Journey*, is powered by four Saito .65 4-strokes and has more than 450 flights on it. Tommy Armstrong's yellow-tailed, W 339163 bomber has 36 flights under its belt; its power comes from four O.S. FS .46 2-stroke engines turning 3-blade, 11x7 Graupner props. The 120-inch bomber has Likes Line retracts and is built from the Westcraft kit. Tommy won the kit at the 1994 Bomber Field event and is very pleased with the way the aircraft flies.

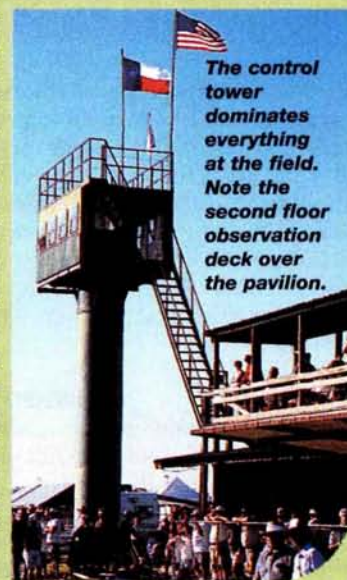
An impressive B-24 built from the American Eagle kit by Jack Spears was flown by club president Keith Frederickson. Keith put in some of the smoothest flights I've ever seen; he greased each landing. B.B.'s famous B-29 Super Fortress *Enola Gay* was also in the air. Again flown by Keith Fredrickson, the B-29 had a 169-inch span and was powered by four 1.20ci 4-stroke engines. Built from Don Smith plans, the huge plane made several bombing runs and even dropped a couple of mock A-bombs!

Each year, there is a bomber competition in which judges evaluate each of the planes' performances and award a special prize. The winner this year was Wendell Maakestad with his smooth-flying B-17. Wendell's Westcraft bomber was powered by four Saito .65 4-strokes with an Airtronics Vision for control.

## THE Bomber Field Club

Membership in the Bomber Field Club is open to all and consists of people from many backgrounds and with many interests. Though the focus of the club is big scale models, all types and sizes of models are welcome. Club membership can include the whole family; the club encourages member families to come out and enjoy the facility. Regular family membership is \$200 per year, while Senior (over 60) family and Associate memberships are \$100 per year.

Meetings are held at the field in Monaville, on the first Sunday of each month, and there is a monthly newsletter called "The Bombardier." For more information on becoming a member, you can phone one of the Club officers: president Keith Frederickson, (713) 592-5220; v.p. Bob Buckbee, (409) 764-9067; or Club secretary Carol S. Thomas, (409) 826-9775. The club also has a website: <http://pages.tca.net/cbuckbee/bomber.htm>, where you can find directions to the field and view an impressive collection of event photos. You can email the club at [bomber@tca.net](mailto:bomber@tca.net).



From the paved runway and roomy pit area to the covered pavilion, observation deck and food concession, the friendly, laid-back atmosphere of Bomber Field makes for an industrial-strength, must-attend event. If you have never ventured way down south to the land of bombers, you owe it to yourself as a modeler to go at least once. I'll bet you can't attend just one! Keep the third weekend in September free, and we'll see ya there! Now, if only I could remember who makes that B-36 kit .... ✚







by Gerry Yarrish

The very first time that I saw the aircraft, I knew that one day I would have one in my stable of RC models. Its simple yet impressive lines, coupled with the striking red, white and black paint scheme, took up residence in the daydreaming area of my brain and stayed there for a very long time. The airplane I'm speaking of is the unlimited aerobatic, Jon Staudacher-designed S-300; specifically, the 300GS flown by airshow pilot and IAC World aerobatic competitor Michael Goulian. I first learned of the airplane's existence when I saw its photo on the cover of a book Mike Goulian co-wrote: "The Basics of Aerobatics." After that, I began to look for as much information on the 300GS as I could find. I even designed a 64-inch-span, .90 4-stroke-powered 300GS to satisfy my need for a flying model. You can imagine my delight when, at the '99 WRAM show in Westchester, NY, I learned that Giantscaleplanes.com (GSP.com) had come out with a 30-percent scale, almost-ready-to-cover (ARC) version of my favorite aerobat.

PHOTOS BY WALTER SIDAS & GERRY YARRISH

Giantscaleplanes.com

# Staudacher S-300

A 30-percent-scale ARC for IMAC competition

## WHAT YOU GET

Distributed by Hobbies & Helis Intl.\*, the GSP.com Staudacher comes in a fairly large container and is 90-percent factory-built, leaving only the most basic of assembly tasks to the modeler. Included are the fuselage with wing-mount-tube assembly installed, but not glued into place, two wing panels completely covered with balsa and the ailerons already cut out. All the tail surfaces come built and are ready to hinge and install. Also included are the aluminum wing tube, a formed aluminum landing gear, a tinted canopy, a gelcoated fiberglass engine cowl and wheel pants. An impressive collection of control hardware, nuts, bolts and washers is available separately. Since it's an ARC, the model does not include covering material and decals, nor are there any paper instructions in the box.

This Staudacher is an advanced design that's intended for experienced pilots, so GSP.com has chosen not to include any paper instructions; they may, however, be downloaded from the GSP website at [www.giantscaleplanes.com](http://www.giantscaleplanes.com). I do advise that you download the instructions before you begin assembly. [Editors' note: a CD-ROM with instructions will be included in future kits.]

## ASSEMBLY

Assembly begins with hinging the ailerons to the wing panels and installing the aileron servos. The wing panels come with the wing-tube sockets already installed and the servo-wire-lead channels already cut for you. I used large Robart\* HingePoint hinges for the ailerons as well as for the rest of the control surfaces. I drilled the holes for the hinges with a length of

sharpened, 3/16-inch diameter brass tube chucked in my electric hand drill. Do not epoxy the aileron hinges into place until after the model is covered. Rocket City\* hardware is supplied in the optional hardware package, and I used it with my evaluation kit. The aileron control horns, the rudder and elevator horns are made from long, threaded rods and use heavy-duty clevis connectors.

The next step is to attach the wing panels to the fuselage and check for proper wingtip-to-tail alignment. When I assembled the wings and fuselage, I found a difference of about 1/4 inch between the two side measurements. To fix this and to make the wing panels sit flush against the fuselage sides, I had to adjust the placement of the fiberglass alignment tube inside the fuselage. I used a moto-tool to elongate the holes in the sides of the fuselage so the



Access to the radio and other internal systems is very easy with the large fuselage hatch just in front of the canopy. Here, I'm buttoning up the Staudacher for another flight.



## MICHAEL GOULIAN

**M**ike Goulian of Arlington, MA, is one of America's premier airshow and aerobatic competition pilots. His family owns and operates Executive Flyers Aviation, one of the Northeast's oldest and largest flying schools.

At 17, Mike won his first aerobatic title and performed in his first airshow. At age 22, he became the U.S. national champion in the advanced category, and a year later, he won the Fond du Lac Cup invitational competition. By 1992, he was the top-ranked male aerobatic pilot in the U.S. and a silver medalist in the unlimited category—an achievement he repeated in 1993 and which placed him on the 1994 U.S. national aerobatic team for the world aerobatic championship held in Hungary.

In 1995, Mike became the U.S. national champion in the Unlimited category. He was also a member of the 1994, '96 and '98 U.S. aerobatic teams.

Mike's aerobatic accomplishments led him into high-energy, airshow-display flying. In 1995, he became a member of the Toyota Airsports team, and he was sponsored by Ray Ban, Looking Glass Technologies, Flight Unlimited and the Breitling Swiss Chronograph Co. Today, Mike is associated with the Avidyne Corp.

Mike served as prime consultant for the Flight Unlimited aerobatic flight-simulation software program produced by Looking Glass Technologies. He has also been shown performing in the PBS program "Nova," and on ESPN.



PHOTO COURTESY OF MICHAEL GOULIAN

alignment tube could move around. I then reinstalled the wing panels and when everything lined up properly, I epoxied the alignment tube and plywood doublers into place with slow-setting Anchor Bond\* adhesive. Once the epoxy had set, I removed the wing panels and installed the wing's 1/4-inch alignment and anti-rotation dowels. After making sure that the wing incidence was at 0 degree, I added the 1/4-inch ply dowel doublers and finished assembling the rest of the fuselage.

I then glued the vertical fin and horizontal stab into place and made sure they were properly aligned with each other and with the wing panels. In retrospect, I should have installed them after the engine. I made the tail-rigging braces with Du-Bro\* hardware, 4-40 pushrod wire and 4-40 socket-head attachment bolts. When the tail feathers have been attached and



## SPECIFICATIONS

**Model:** Staudacher S-300

**Type:** almost-ready-to-cover (ARC)

**Scale:** 30 percent

**Manufacturer:** Giantscaleplanes.com

**Distributed by:** Hobbies & Helis Intl.

**Length:** 78 in.

**Wingspan:** 90 in.

**Wing area:** 1,414 sq. in.

**Weight:** 24 lb., 9 oz.

**Wing loading:** 40 oz./sq. ft.

**Engine req'd:** 3.7 to 4.2ci

**Engine used:** 3W-60 (60cc)

**Radio req'd:** 4-channel (rudder, ailerons, throttle and elevator)

**Radio used:** JR 8103 TX w/FMA Fortress RX and FMA 3601 servos

**Price:** \$599

**Comments:** the model does not come with instructions, but they are available from the company's website. The kit comes 90-percent factory-built and includes gelcoated fiberglass engine cowl and wheel pants, tinted canopy, aluminum wing tube and landing gear.

### Hits

- Excellent workmanship throughout.
- Easy to set up; plug-in wing panels.
- Excellent flight characteristics.

### Misses

- Downloaded instructions are not of the same high quality as the rest of the kit. (All future kits will include CD-ROM instructions with digital pictures.)

### ENGINE SPECIFICATIONS

**Name:** 3W-60

**Displacement:** 60cc (3.6ci)

**Dimensions:** 6x3.9 in.

**Weight:** 5.3 lb.

**Horsepower:** 6

**Rpm range:** 1,600 to 6,500

**Prop range:** 22x12 to 24x10

**Price:** \$585 (muffler available separately)

hinged (but not glued), you can install the rudder and elevator servos (two each) and make up your control linkages with the Rocket City hardware. It is advisable to do all of the model's assembly before covering the model; this gives you much better access to the inside. Once everything is installed, you can cover the control surfaces and fuselage, then glue all the hinges into place. Note that if you intend to use HingePoint hinges, you should add balsa blocks to all the hinge locations before covering.

I replaced the stock 6-32 landing-gear-mount screws with six, 10-32 caphead screws. When drilling the gear for the mount screws, make sure that you check the placement of internal structures so the 10-32 blind nuts can be installed

without obstruction. I also used a Scale Aviation USA\* 1/3-scale TA 2000 tailwheel unit (2-inch wheel). This required the installation of an 1/8-inch ply doubler in the tail and two 6-32 blind nuts for the tailwheel assembly's attachment. Having the fuselage sitting on its landing gear makes it much easier to work on the engine installation.

### ENGINE INSTALLATION

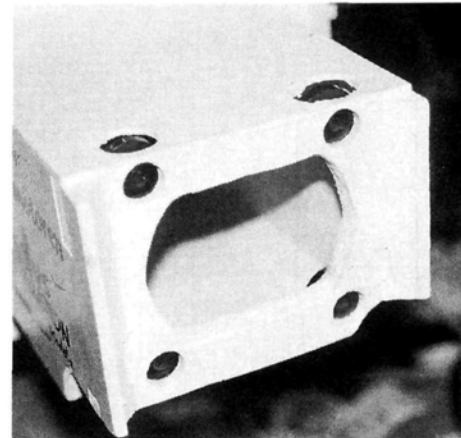
For power, I chose a 3W-60 (60cc) gas engine from Cactus Aviation\*. I also used Scale Aviation USA blue soft mounts (60 durometer) to install the engine to the engine box. Because the 3W-60 is a rear-induction engine, I had to cut a large opening in the firewall to allow the carb and induction system to pass through. This placed the carb well within the firewall box structure. I also removed the lower portion of the firewall to clear the Johnson\* smoke-equipped Pitts-style muffler. Though I did remove a large amount of wood from the firewall, it has proven to be more than strong enough to withstand the vibration and torque of the engine. The length of the 3W-60 required that the sides of the fuselage at the firewall be extended forward about 1 inch so that



**FMA S3601 coreless servos control the rudder and elevator halves. The servo-mount openings are already cut for you.**

there is something to screw the cowl to. I added 1/4-inch balsa sheet and plywood hard points to the face of the firewall and installed 2-56 blind nuts to use in attaching the cowl. The added fuselage length is hardly noticeable. The electronic ignition is powered by a 1400mAh battery on top of the engine box, just in front of the firewall.

Finishing up the powerplant is a 4 1/2-inch Tru-Turn\* spinner, a 22x12 Zinger\* prop and a Don Harris\* smoke pump system. I used a three-line system for both the fuel and smoke fluid tanks, and I chose B&B\* smoke fluid. To keep the smoke pump clean, I installed a brass filter/clunk in the smoke tank and placed an in-line filter between the tank and the pump. Like a receiver, the smoke pump is wrapped with foam and is held in place with rubber bands above the fuel and smoke tanks. I handle refueling and filling the smoke tank with EZ-Filler fittings attached to the main fuselage hatch.

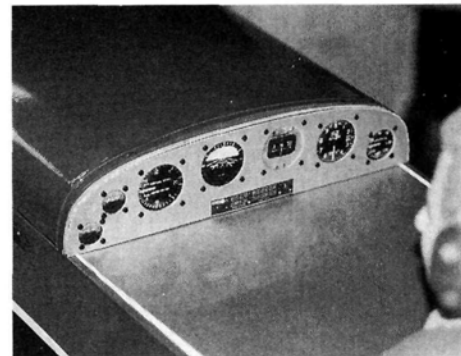


**This large opening in the firewall allows the engine's rear-induction system to be passed through it and then placed inside the model. Note the engine soft mounts are in place.**

### RADIO GEAR AND FINISH

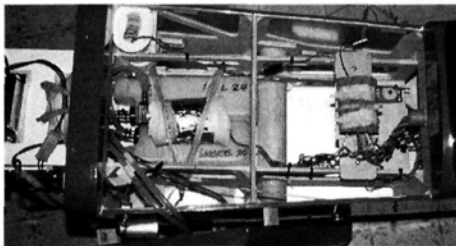
I used a JR\* 8103 TX and an FMA\* Fortress receiver and FMA 3601 servos for rudder and elevator control. I used JR-4721 servos on the ailerons. A standard FMA servo controls the throttle, and the Don Harris smoke pump plugs directly into the receiver (I chose the gear switch for smoke-on control). I used a 4-cell, 1,500mAh battery pack to power the radio; the rudder and elevator servos are in the tail, just under the LE of the horizontal stab. Thirty-inch-long servo-extension leads (four of them) connect the servos to the receiver. I used a cardboard tube as a conduit to guide the leads from the tail to the radio compartment, just in front of the cockpit. The receiver sits on a lite-ply plate that's glued to the aft portion of the internal engine-box structure. To prevent engine ignition noise from migrating to the radio system, I used a plastic Sullivan\* Nyrod to connect the throttle servo to the carb.

I covered the model completely with Carl Goldberg Models'\* new Ultracote Supreme film. This new, iron-on covering has a silver backing to render it completely opaque and prevent strong sunlight from shining through the model's structure. One thing that you must do when using Ultracote Supreme is to mount your receiver antenna externally on the model. Because it has the silver undercoating, the covering will shield an



**A requirement for IMAC competition, the instrument panel and pilot bust are nice touches for the front office.**





*With the main fuselage hatch removed, you have total access to the radio and fuel system. Notice the Don Harris smoke pump mounted just above the fuel tank.*

internally mounted antenna and can contribute to signal loss. This warning is printed on the covering's packaging and should be heeded.

The decals that turn the model into Michael Goulian's 300GS come from Butch Andrews of Model Graphics\*. These vinyl, stick-on decals are simply great and are very easy to apply either wet or dry. I painted the top portion of the white, gelcoated engine cowl with Ultracote paint and painted on the black stripe to match the film stripe ironed into place on the fuselage. My only real challenge in covering a model of this size was getting used to how much covering was actually needed to do the job. Six rolls in all were required with a fair amount of scrap left over. Since I did not want to have several seams along the length of the fuselage, I unrolled the covering film completely and cut the pieces for the sides and bottom lengthwise from the roll. When overlapping the various colors and to keep the edges straight, I found it helpful to cut the covering oversize and then tape it into position with masking tape before tacking it into place with the iron. The end result is definitely worth the extra effort.

The finishing touches were the addition of a homemade instrument panel and a Hangar 9\* 1/3-scale pilot figure inside the cockpit. Since these are also required for IMAC competition, there is no reason not to include them, as they add so much to the model's finished appearance.

#### FINAL SETUP

The instructions indicate that the CG should be between 1.75 and 2 inches in front of the former that sits just in front of the wing-mounting tube. I found this to be conservative; the model flew beautifully with the CG 1 inch in front of this former. Several highly experienced pilots have indicated that a CG placed at the LE of the wing tube is also acceptable for advanced performance. I added 9 ounces of lead to the nose of the model attached to an aluminum extension to bring the weight as far forward as possible (next to the engine case). Also, if you use a 3W-60 or any other

## FLIGHT PERFORMANCE

### • TAKEOFF AND LANDING

The S-300 leaves the ground at just above 1/3 throttle with very little up-elevator required. It's such a big model that almost no rudder was needed to keep it tracking straight down the runway (if you apply throttle slowly). At slow speeds, the aileron control comes online right away, and the model feels very comfortable. Once airborne, climb-out is effortless at about 1/2 throttle, and if you feel the need for some vertical right after takeoff, full power will have you at cloud level in no time.

The Staudacher likes to be set up for a wheel landing, so don't pull power much past 1/8 throttle. Keep the nose down and don't try 3-point landings, as the wing will stop flying abruptly and you could find yourself too low, too slow and out of options. When you have the field made, pull the throttle back to just above idle and let the model settle onto the gear. A little push of down-elevator will stick the model onto the ground, then let the model slow down on its own. Not much rudder is needed unless you have a crosswind; when you do crank in some rudder, the model yaws very nicely and gives you excellent control. On my first landing, I did not have the idle low enough, and the model sailed by about 4 feet above the ground. On the next attempt, I slipped the model slightly to scrub off some airspeed just before touchdown.

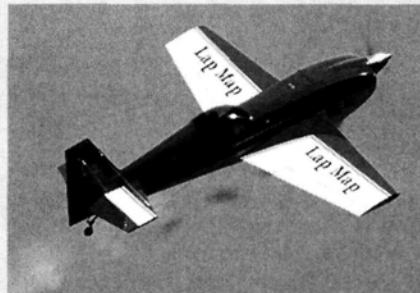
### • SLOW-FLIGHT PERFORMANCE

Slowed down for picture-taking, the model behaved nicely. A bit of power is required when you pull back on the elevator, but I felt very comfortable doing top-rudder passes for the camera. On one pass, I slowed the Staudacher down a little too much, and it began to stall. I added power, dropped the nose slightly, and the model flew out of the situation easily without dropping a wingtip.

At a high altitude, I pulled the power to idle and slowly pulled back on the elevator stick. When the model stalled, it dropped its nose and mashed forward; nothing unusual there. It's such a large model that it takes some getting used to before you can tell whether you're going too slow.

### • AEROBATICS

This is what the Staudacher is all about. From the start, you know you have a potent design and that the only limitations will be your imagination and experience level. I started out slowly and worked up the ladder to more aggressive maneuvers. First, I cranked in full-deflection aileron rolls. On low rates (1 inch up and down), the model takes



about 1 second to go through 360 degrees. On high rate (1 3/8 inches up and down), you get about 1 1/4 rolls in the same time. For my style of flying, this is very manageable. Next, I applied full power and pulled back on the stick for a big, very tall loop. Here, you understand the phrase, "There's no substitute for power." The Staudacher reached the top of the loop with no effort at all, and I actually started pulling power back on the way up so I was at about 1/2 throttle as I reached the inverted position. To round out the loop, I released pressure on the stick and let the model float a little before letting gravity take over; I pulled power to about 1/4 throttle as the model headed down the back side. At about the 5 o'clock position, I pulled in more up-elevator and brought the power back up and the model exited cleanly—straight and level. Perhaps it is because of the model's mass, but I did not have to apply much rudder at all to keep it on track and the loop vertical. Of course, there was almost no wind.

Combining rolls and loops is what aerobatics are all about, and the Staudacher handles everything effortlessly. I really enjoyed doing 1/2-Cuban-8s with the smoke system turned on. Having that smoke tracer behind you is a big help when you try to keep things lined up. Several times, I was able to cut back into the end of my smoke trail as I exited a maneuver—very cool. Knife-edge requires some power and about 1/2 rudder-stick deflection. That long, flat-sided fuselage really helps extend the maneuver. Inverted flight is also effortless, and some forward stick is required. Spins do require that you fully stall the model before cranking in full rudder and aileron. If you enter with too much airspeed, the spin quickly becomes a spiral dive. Inverted spins are also easily accomplished. When you let go of the sticks, the model stops spinning in just under 1/3 of a spin. Some opposite rudder should speed recovery time.

The Giantscaleplanes.com Staudacher is perhaps the most exhilarating model I have ever flown. Powered by the 3W-60 engine, it is truly an unlimited aerobatic performer.



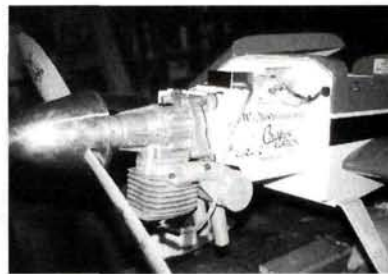
## 3W-60 POWER

The 3W engines from Cactus Aviation are powerful, well-made powerplants imported from Germany. Each 3W engine comes with an electronic auto-advance ignition system and a six-bolt prop hub. Since the 3W-60 I used to power the Staudacher is a rear-induction engine, it also came with an aluminum mount plate. An ignition 1,400mAh battery pack and switch harness is also available from Cactus Aviation.

Having a rear-mounted induction system and carb means that you have to install the engine so the carb passes through the firewall assembly. Also, having the carb inside the fuselage requires you to vent the fuse somehow. I installed a vent in the back of my model's fuselage, cut into the rear servo-access hatch. This is a good news, bad news situation; it's very good that the engine will not be likely to "ingest" something at the flying field, as the carb is well protected from debris, but its location inside the fuse makes it a challenge to adjust the carb and choke.

To gain access to the needle valves, I drilled a hole in the bottom of the engine box just behind the muffler; the hole was just big enough to allow me to insert a long, skinny screwdriver. Unlike the way you do it with a glow engine, you must only adjust

the carbs when the engine is not running. Also, the carb's choke butterfly has to be manually operated and, since it's inside the fuselage, the choke linkage must be custom-fit to the engine. I used a very simple setup on my model; it consisted of a single length of 4-40 threaded pushrod. The pushrod wire is attached to the choke with a common metal clevis that screws onto the end of the wire. The pushrod leads aft from the carb and, to clear the fuel tank, it has a mild jog bent into it. The pushrod wire goes through a brass guide tube that is glued to one of the fuselage formers; the end of the wire is bent at a 90-degree angle. The bent portion is about 1/2 inch long and exits the fuselage through a slot cut into the fuselage side, just below the main fuselage hatch. Sliding the pushrod end forward opens the choke; pulling it aft closes it. The system works extremely well and keeps your helper's fingers well away from the prop while starting the engine.



rear-induction engine, you should add a vent to the fuselage so air can be drawn in to feed the carb. I added a vent to the rear servo-access panel under the stab.

The first time I ran the engine, I knew that it would be a perfect match for the

Staudacher. Total building time, including covering, was 25 to 30 hours; a very short time compared to building a complete wood kit. I enjoyed assembling and flying the Giantscaleplanes.com Staudacher very much, and I am com-

pletely happy with its performance. If you want to break the Extra, CAP and Giles habit, why not give the Staudacher a try? Go ahead; you *know* you want to!

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. \**

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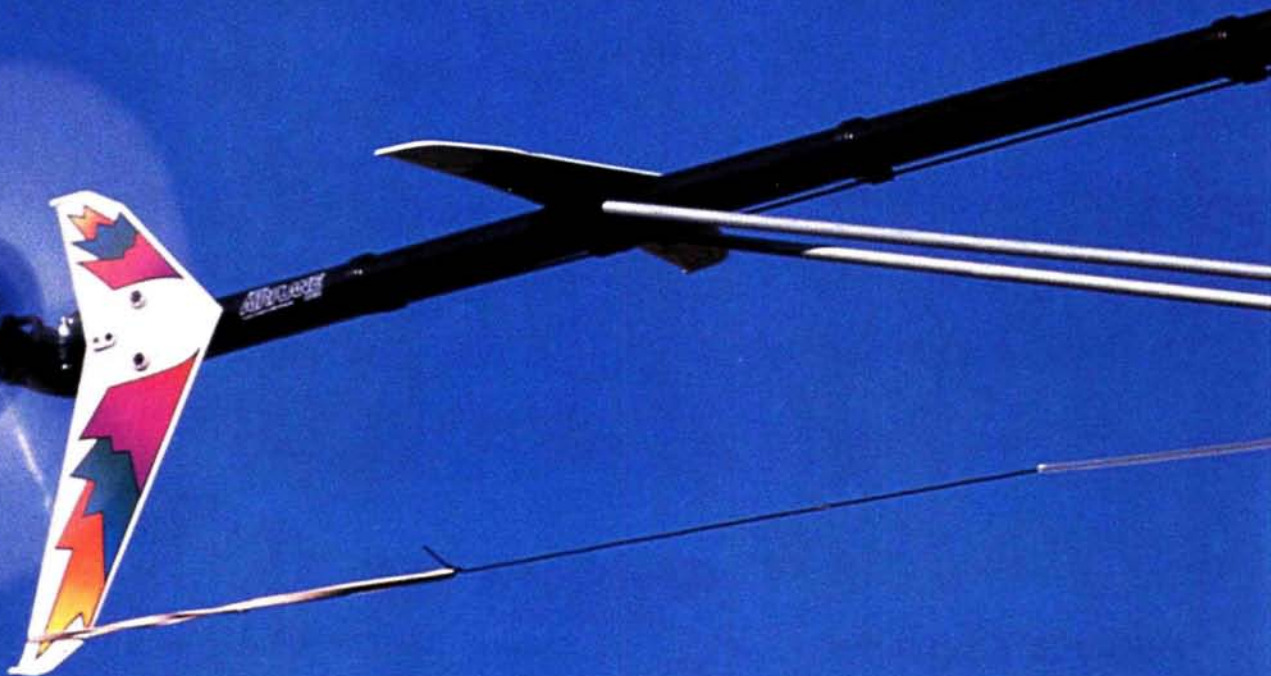
# HIROBO

by Rick Bell

## GPH 346

with belt-driven tail

*Impressive performance in a midsize package*



*The Hirobo GPH 346 is a midsize heli that performs excellently and has power to spare. It can easily be set up for wild 3D aerobatics or toned down for exceptional sport flying.*

**W**ell known for its high-quality, world-class helicopters, Hirobo\* now brings us the midsize GPH 346. Intended for budget-minded modelers, the GPH 346 fills the gap between the smaller, .30-size helis, such as the Shuttle, and the larger, more costly, .60-size competition helis. In fact, the GPH 346 delivers the best of both worlds. Its high power output and beefed-up control system allow it to go from mild to wild performance, and you can set it up for anywhere in between; whatever suits your skills. The latest trend in helis is to use belt-driven tail rotors, and the GPH is now available with either a wire-driven or a belt-driven tail rotor. This review covers the belt-driven version of the GPH.





## SPECIFICATIONS

**Model:** GPH 346

**Type:** helicopter

**Manufacturer:** Hirobo

**Main rotor diameter:** 53 in. (1,346mm)

**Length:** 46 in. (1,170mm)

**Radio req'd:** 5- to 6-channel heli radio

**Radio used:** JR X8103 (w/5 NES 531 servos)

**Engine req'd:** .46

**Engine used:** Enya SS .50 (w/GM9SB carb)

**Street price:** \$479.99

**Features:** all-metal, stacked-aluminum chassis construction, many pre-assembled components, durable molded canopy, bearings on all pivot points.

**Comments:** the Hirobo GPH 346 is a great performing heli. It goes together quickly and easily. The manual is easy to follow and provides plenty of direction for the all-important setups. Flight performance is solid and predictable, and the model is capable of 3D aerobatics.

### Hits

- Easy to build.
- All-metal construction with ball bearings on pivot points.
- Precovered and weighted main rotor blades.
- Great manual with good setup instructions.
- Solid flight performance.

### Misses

- A couple of nuts and bolts were missing.



## HIROBO GPH 346

### KIT CONTENTS

The moment you open the box, you'll see that this is not a run-of-the-mill helicopter. The heli's fine machining and well-designed components are evident. The GPH goes together easily and quickly because many of its subassemblies are factory assembled and ready to install. The factory-assembled parts include the main rotor head, the tail rotor, the washout unit, the main gear (with auto-rotation bearing), the counter-gear assembly and the swashplate. Other kit items include covered and weighted main blades, a tough, white plastic, wrap-around canopy, colorful decals and a formed windshield. The rest of the hardware parts are in numbered plastic bags that follow the instructions. The manual is thorough and has many numbered drawings to clarify the assemblies as you go along. So let's clear our workbench and start building!

### ROTOR HEAD

Assembly starts with the main rotor head and, because it is factory assembled, all that needs to be done is to check the screws and nuts for tightness. I do recommend that you check all factory-assembled components for loose fasteners and that their assembly matches the manual. All the fasteners on the test heli were assembled correctly and tightly.

The seesaw assembly is next. I noticed that many of these parts are the same as those used on the Hirobo Shuttle, and since I had recently built a Shuttle, the assembly proceeded easily. The flybar should be centered in the rotor head and

away from the seesaw assembly. To help with the dynamic balance later, I put an 1/8-inch wheel collar on each side of the flybar before I installed the paddles. Moving these collars in or out can greatly help minimize rotor-head vibration.

A quick check on a Robart\* HighPoint balancer showed that the rotor head was very close to being perfectly balanced, so I decided to leave well enough alone. The double-pinned radius block is now fastened to the main shaft followed by the swashplate, washout unit and the rotor head. The mast lock is also temporarily put on the main shaft; it will be set later, after the chassis has been built.

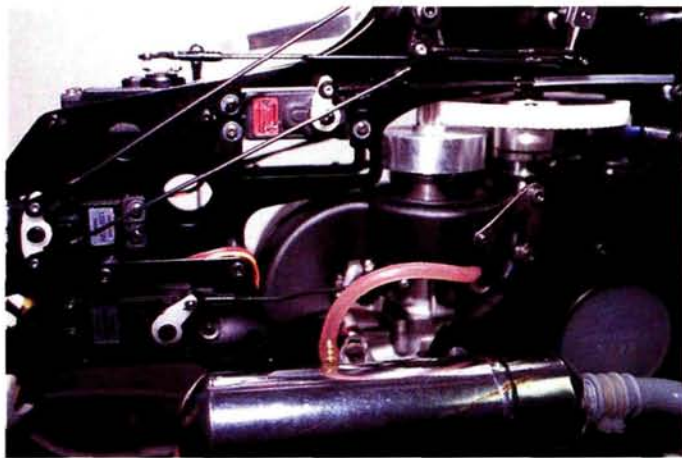
### ENGINE, FAN AND CLUTCH

The fan/clutch assembly attaches directly to the engine crankshaft with industry-standard tapered collets. This system provides a quick and easy way to center the fan on the engine and produces a minimum of runout. The one-piece clutch/start shaft attaches directly to the fan hub and will require the use of a dial indicator to check and minimize shaft runout. Make sure you add thread-lock to the clutch-shoe mounting bolts. (For detailed instructions

on how to check clutch shaft runout, see the April '99 issue of *Model Airplane News*).

The engine of choice for the GPH is an Enya\* SS .50. The engine mount that comes with the kit is drilled and tapped for an O.S. .46, so I slightly enlarged the holes in the Enya's mount tabs to make it fit. After I had enlarged the holes, the engine fit into the mount without any problems. An added benefit of enlarging the tab holes is that it permits the engine's alignment with the gear train to be tweaked somewhat; this helps get the gear mesh exactly right.

Next, slide the clutch bell over the clutch assembly. The top of the pinion gear in the clutch bell fits into a support bearing in the bottom of the clutch bearing block. To prevent the top of the pinion gear from wearing too quickly, I make sure to apply thread-lock to the end of the pin-



**The chassis's double-frame design is rigid and relatively easy to assemble. Note the pull/pull control pushrod setup that provides solid control response.**

ion gear standoff and the inner race of the support bearing. This prevents the pinion gear from moving in the bearing and greatly extends the life of the assembly.

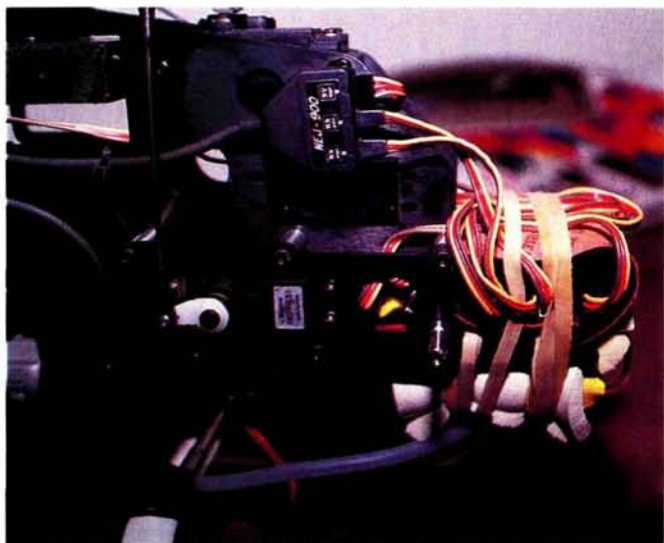
### CHASSIS ASSEMBLY

The main chassis frame on the GPH is made from flat, stacked, upper and lower aluminum plates separated by aluminum spacers and held together with metal bearing blocks. This type of construction makes it very easy to build a straight, rigid chassis with little fuss. (For proper chassis-assembly techniques, see the June '99 issue of *Model Airplane News*).

First, assemble the upper frames and use the main shaft to line up the upper and lower bearing blocks. Also, make sure to install the elevator lever before you bolt the two frame halves together. When the frames have been assembled, install the collective pitch arms, the X-type lever and the two aileron L-type levers. Be sure to add thread-lock to the elevator torque lever pivot setscrew, and attach the pivot lever to the elevator lever shaft. The instructions are well illustrated and will make assembly very clear.

The next step is to install the main shaft and gear assembly along with the factory-assembled swashplate. The main gear comes already assembled with the auto-rotation drive-shaft assembly and needs only to be slipped onto the bottom of the main shaft and bolted into place. Be sure to pull up on the shaft when you install the large mast-lock collar.

Assembly of the fuel tank is next, followed by the lower chassis frame and the engine/clutch. Note that rubber frame gaskets are used to isolate the tank from the lower framework. The lower chassis is comprised of the left and right frames, the horizontal RX and gyro mount plates, several aluminum spacers and two, lower-frame-stiffening angles. Assemble the lower chassis including the engine/clutch assembly, but do not completely tighten the bolts. Attach the upper and lower chassis frames to each other, and make sure



**The RX, battery pack and switch harness all fit nicely on the front mount plate. A hole cut into the bottom of the canopy permits easy access to the battery switch.**

the seesaw assembly then secured into place. The flybar paddles are the same as those used on the Shuttle RG and give the model great performance; they are fully symmetrical and have removable weights so you can fine-tune the control response. Be sure each paddle is the same distance



## FLIGHT PERFORMANCE

To make the first flights a bit easier, I broke in the Enya SS .50 on the bench. This allowed me to get the carb closely dialed in and generally made it easier to start the engine. Before flying the GPH, I dialed in pitch and throttle curves for normal and aerobatic flight modes.



Here, the GPH is about to touch down after an auto-rotation (note that the tail rotor is not moving). The weighted blades make autos very easy.

The 346 is a nice, midsize heli that I enjoyed flying from the very start. During the first liftoff, a slight blade-tracking adjustment was needed to bring the blades into alignment. After that, a little more hovering pitch and a little less hovering throttle were needed

to bring the rpm down, and this resulted in a very stable, smooth hover. The cyclic response is very positive and quick. I added a little cyclic exponential to make the cyclic response more balanced. After the heli had broken in a bit—and my nerves had calmed down—it was time to explore the flight envelope.

Transition into forward flight consists of nothing more than pushing the nose down and increasing power. The GPH responds well to inputs, and it's easy to become confident with this heli. Control authority is very good; loops are easy and so are rolls. Tail-rotor authority is also powerful, and I think the 346 will make a good 3D platform. I was very surprised when I tried an auto-rotation; most kit-supplied wooden

blades are marginal for them, but the weighted blades supplied with this kit provide lots of inertia, even in calm conditions. Auto-rotations are a lot of fun with this chopper. My overall opinion of the GPH 346 is that it's a very solid performer that can do it all.

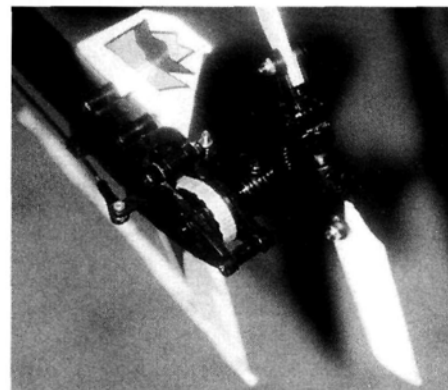
that the upper part of the clutch housing is inserted properly into its support bearing that has already been bolted to the top frame. After making sure that both frames are straight and squarely assembled, I removed each bolt and applied thread-lock to prevent them from vibrating loose later on. To provide a stable work base, I jumped ahead in the manual and installed the landing gear to the chassis.

the bottom aft of the lower chassis and are attached to the boom with a molded bracket. This bracket is also used to install the horizontal stabilizer.

The tail-rotor gearbox is very similar to that of the tried-and-true Shuttle; the tail-rotor blade-grips use two bearings for support, and the entire assembly is very tight and slop free. Assemble the gearbox and install the drive belt and the belt-pulley guide. The guide has a left and right side (as indicated in the manual); be certain to install it correctly. To complete the assembly, assemble the blade grips and attach them to the output shaft of the gearbox. Slide the drive belt through the tail boom and attach the boom to the chassis.

Before you tighten the boom clamp bolts, slip the belt over the counter gear and pull the boom out to place tension on the belt. While installing the tail boom, make sure to twist the drive belt in the correct direction so that when you turn the main gear, the tail rotor turns in the correct direc-

tion. Finally, install the boom supports and screw the horizontal stab and vertical fin into place. Trim the openings in the one-piece plastic canopy and add the decals. I clearcoated the canopy with LustreKote\* paint before I applied the graphics, then I sealed them into place with several additional coats of clear. The formed windshield attaches with several small screws.



The belt-driven tail rotor lowers the model's parts count and simplifies assembly and maintenance.

### FINAL ASSEMBLY AND SETUP

Final assembly consists of mounting the servos, RX, battery pack and switch harness, installing the gyro and gyro amplifier and making up and installing the control pushrods. All of Hirobo's construction manuals are laid out in great detail, and the GPH's manual is no exception. Just follow the manual for pushrod lengths and radio setup, and you'll be rewarded with a heli that's ready for aerobatics.

I used a JR\* 8103 computer radio and NES 531 servos on all the controls. Since I also installed a JR G900 piezo gyro, I used a 1400mAh battery pack. The gyro is located on its own shelf just aft of the main rotor shaft.

Because I installed an Enya .50X engine, I had to slightly modify the throttle linkage. I extended the throttle arm by using a long screw to bring the ball-link attachment ball outward. This eliminated having to bend the pushrod excessively. I also had to grind a little material off the fan shroud to provide clearance for the throttle arm; otherwise, it would have contacted the corner of the shroud. Not a big deal, just something to watch out for.

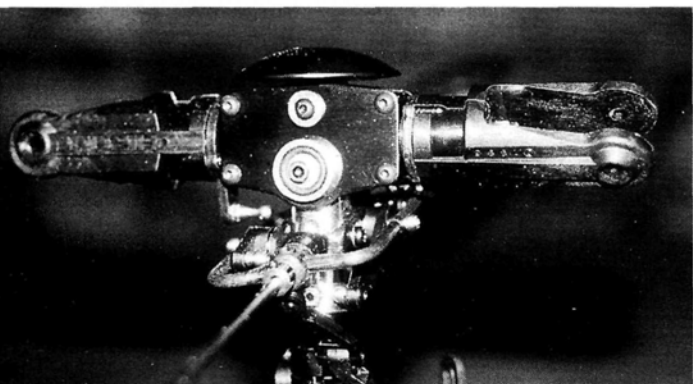
### FINAL THOUGHTS

The Hirobo GPH 346 is a top-of-the-line, midsize heli that can do it all. The GPH handles general sport flying to outrageous 3D aerobatics and comes back for more. It builds quickly and easily, and its flight performance is solid and predictable. As far as I'm concerned, GPH stands for Great Performing Heli! I think you'll agree.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ✦

### TAIL BOOM AND DRIVE

As I mentioned earlier, this version of the GPH has a belt-driven tail rotor; this reduces the number of parts in the drive system and simplifies assembly and maintenance of the model. The large, 21mm-diameter tail boom is supported by two braces that are bolted to



The main rotor head comes factory-built, and this greatly speeds the building process.





The author holds an earlier version of the Dragonflyer. Note the use of paper cones instead of rotor vanes attached to the outside edge of the disk.

I had expected every head to swivel when my latest novelty ship buzzed past the Winnepesaukee radio controller's flightline. With the help of Armand Cote, I'd been testing the model on the sly for a couple of weeks. Armand is about as unflappable as they come, but the first time he saw the Dragonflyer, I could tell from his expression that I had a showstopper. This thing should get plenty of attention.

Did I say "attention"? That might not be the best word to describe the reaction it got from club members. How about startled disbelief? Not exactly open-mouthed wonder; more like, "You've got to be kidding!" And after several flights, "OK; we admit it flies, but what's the principle behind this aerodynamic outrage?" Although the Dragonflyer comes across as a fun novelty

project, the rotating, vaned disk that supports it is a venerable aerodynamic idea that I first read about in *Modern Mechanics* (later, *Mechanix Illustrated*) in the mid-1930s.

As for the dragon motif, it's simply my artistic rendering of the fin area that is vital to the model's aerodynamic stability. I thought it was pretty neat the way Norsemen put dragon heads on the prows of their raiding vessels. I decided that having Norwegian forebears gave me license to put one on my plane; besides, I like fire-breathing dragons.

Dragons aside, though, I kid you not; disk aircraft—with or without vanes—is a very old idea. Many patents have been granted for aircraft of this general shape. I wrote about several disk types in the September 1950 issue of *Model Airplane News*. Later, I

# THE DRAGONFLYER by Roy L. Clough Jr.

*The ultimate in  
"unusual"—a lifting-disk  
sport model*



## SPECIFICATIONS

**Model:** Dragonflyer

**Type:** sport lifting disk

**Disk span:** 19.25 in. (diameter)

**Length:** 38 in.

**Weight:** 1½ lb. (25 oz.)

**Disk area:** 291 sq. in.

**Wing loading:** 12.37 oz./sq. ft. @ 1½ lb.

**Engine req'd:** Cox Medallion or Cox TD.049

**Prop used:** Master Airscrew 7x4

**Radio req'd:** 2-channel (elevator and rudder)

**Comments:** designed by Roy L. Clough Jr., the Dragonflyer is an unusual lifting-disk design that turns heads every time it flies. The fuselage is a simple balsa and ply box structure, and the control surfaces are made from sheet balsa. The rotor disk is made from a corrugated cardboard wheel with balsa ribs added top and bottom. Not intended for beginners, the Dragonflyer is relatively easy to build but will require some getting used to when you fly it.



designed a spinning disk saucer that was featured on the August 1962 cover of *American Modeler*. Since that time, many people have built spinning-disk flying models. Most of these spin by torque reaction of a centrally mounted propeller that provides the lift. Ken Johnson built a spectacular version of this type that got a lot of attention when he flew it near a freeway. Cox\* also used this principle for its .049-powered flying toys. In any case, however, the disk part just went along for the ride; flight was no more controllable than a balloon's.

As the Dragonflyer demonstrates, things get more interesting when the disk contributes to the lift. Combining an autorotating rotor with a circular wing opens up possibilities for a whole new class of flying machines.

### CONSTRUCTION

While not intended as a beginner's model, the Dragonflyer is pretty much a straightforward design using sheet-balsa construction. Assembly isn't really difficult, but I'll mention a few things. The sandwiched landing-gear construction is a favorite of mine that goes together easily. The gear struts will take more punishment than the plane can dish out. The radio installation is pretty much standard, and you can use your own favorite pushrod or cable hookup to the control horns. Note the inverted servo mounting. For my

cut a long taper on the end of the fuel line. Push the tapered end in the hole, then grab it with needle-nose pliers and pull the line through the hole until you have as much as you want inside the tank. Cut off the tapered end to form the fuel pickup. The vent line is installed the same way. To signal when the tank is full, the vent line discharges through the bottom of the fuselage.

The rotor disk is built over a spoked wheel cut from 1/8-inch corrugated cardboard. This stuff is used to pack all sorts of computer accessories and is quite easy to come by. The wheel is weighted down on a flat surface and rimmed with lengths of 1/8-inch dowel, which must be spliced together to complete the circumference. Wet the dowels to make them bend easily, then glue them into place with white glue. The rotor hub is a length of 1/4-inch o.d. Plastruct tubing available in most model railroad stores. Brass servo-mounting grommets serve as bearings. The rotor mast is a 16-inch length of 3/32-inch music wire. To glue the wheel to the rotor hub, drill a hole in your building board and insert the hub tube into the wheel then insert the hub into the hole. Measure the hub and

Insert a toothpick stop pin into the inside edge and allow it to protrude 1/4-inch from the vane. (See plans for details.) These vanes are then covered, spaced evenly around the rotor and taped to the outside rotor edge with the stop pin resting against the bottom edge of the rotor. This setup gives the vanes a negative angle of attack.

The fuselage is a very simple box structure consisting of 1/8-inch balsa and 3/32-inch ply formers between 1/16-inch sheet balsa sides. There are 1/8-inch square longerons at the four fuselage corners, and the top and bottom are sheeted with 1/16-inch balsa. The plans show the section of the fuselage bottom that should be covered with 1/16-inch cross-grain balsa sheeting.

The control surfaces, stab, fin and "dragon" are all made from 1/8-inch balsa sheet. Cover the entire plane with lightweight iron-on film. The control surfaces are easily hinged during the covering process. With the surfaces flat on the bench, place an 1/8-inch-square balsa strip between the fin and the rudder and cover the top of both surfaces. Take care not to iron the film onto the spacer strip. Turn the surfaces over, remove the

spacer strip and cover the other side. Now, run the nose of your sealing iron along the hinge gap to fuse the coverings together. Do the same for the stab and elevator. The result will be a smooth operating, sealed



**Yep! The Dragonflyer does, indeed, commit aviation. Though easy to build, it is not for the beginning builder or flier.**

money, the easiest and best way to mount servos is to place a dab of Goop household cement under the servo-mounting lugs. When the adhesive dries, Goop is tough, rubbery and vibration-absorbing yet is easily removed when you want to take the servos out of the model.

The fuel tank is a long-lasting, no-leak quickie made from a 35mm film canister. The best ones to use for tanks are the translucent white ones that have a plug-in cap with a milled rim; they never leak. There is a trick to installing the fuel line with enough pinch to prevent leakage. For standard-size 7/32-inch O.D. silicone fuel line, drill 3/16-inch holes in the tank. Carefully de-burr the holes, then

adjust it so 1 1/2-inches of it stands above the wheel, then glue it into place; make sure the tube is perpendicular to the wheel. When the glue sets, glue on the top 3/16-inch balsa rotor ribs. When this assembly is set solid, it is a fairly easy task to lift the rotor from the bench and glue on the bottom ribs.

The six rotor vanes attached to the rotor disk are airfoil-shaped and are what make the disk spin. Make the vanes from 1/8-inch balsa sheet and sand them to shape as shown on the plans.

hinge that will last the life of the plane.

For power, I used a Cox .09 Medallion engine with a 7x4 Master Aircscrew\* prop. I used a Cox no. 2110 engine mount. The fuel

tank is secured into place behind the firewall with some globs of Goop. There is no throttle control.

Flying the Dragonflyer is the old, familiar 2-channel stuff; flights ended because it ran out of fuel. It isn't necessary to spin up the rotor, as it will come up to speed while the model is taxiing for takeoff. As you would for any short-span plane, go easy on the rudder (1/2 inch left and right) until you get used to the response. Start elevator controls at about 1/4 inch up and down. When the



engine starts to sputter, tuck the nose down and maintain a steep glide path back to the field to keep up airspeed. The

If you want something completely

different, the Dragonflyer is a good project to choose. You'll definitely turn some heads!

[illegible]

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. †



# Airtronics VG600

by Bob Aberle

**A**lthough the RC radio-system market appears to be headed more toward computer-programmable radios, it is interesting to note that manufacturers are still coming out with new, basic, non-computer systems. These radios are easy to operate, provide just enough control features for the beginner and sport flier and, best of all, are available at relatively low prices. Though they don't offer you any computer memory to store control inputs or operate other airborne packs, these radios only require that you read a few pages of instructions before you head for the flying field.

Airtronics\* has updated its long-popular, 6-channel Vanguard Series with the new VG600.

This FM system has servo reversing on each channel and endpoint adjustment (EPA) on five of the six channel functions. The fifth channel is a non-proportional (on or off) retract channel that could also serve as an electric motor's on/off switch. The sixth channel is also non-proportional; it uses a 3-position switch that is ideal for flap- or spoiler-type control.

The VG600 comes with a small, lightweight 7-channel receiver, four standard-size 94102 servos, rechargeable 700mAh transmitter and receiver Ni-Cd packs, aileron extension cable, switch harness, dual-output battery charger, transmitter control input-adjustment tool, extra servo output arms, servo-mounting hardware, a frequency flag and an instruction manual. Systems are available on all 50 aircraft channels on the 72 to 73MHz band. Six-meter frequencies are not available.

## Six-channel value



Six dipswitches control the servo reversing on all channels. EPA pots are available for all channels except the retract (fifth) channel. Main power switch is to the right. At the left is the transmitter crystal.

### THE TRANSMITTER

The VG600 transmitter case is the same as that of the Airtronics RD6000 transmitter, with a large carrying handle molded in its top. The antenna can be retracted so it only protrudes about 2 inches above the top of the case. Control-stick spring tension can be adjusted from the front of the case with a small Phillips screwdriver. This is an excellent idea, since you usually have to remove the rear case cover for tension adjustment. The control-stick length is also adjustable.

Just below the antenna are one red and

four green LEDs that indicate the charge left in the transmitter pack.

The radio has conventional, ratchet-type trims. For many modelers, this provides more convenient trim adjustments because the position of the trim lever roughly denotes the position of the control surface.

Since this is not a programmable computer-radio system, the special features are set with tiny switches and potentiometers (pots). Airtronics supplies a small adjustment tool that is

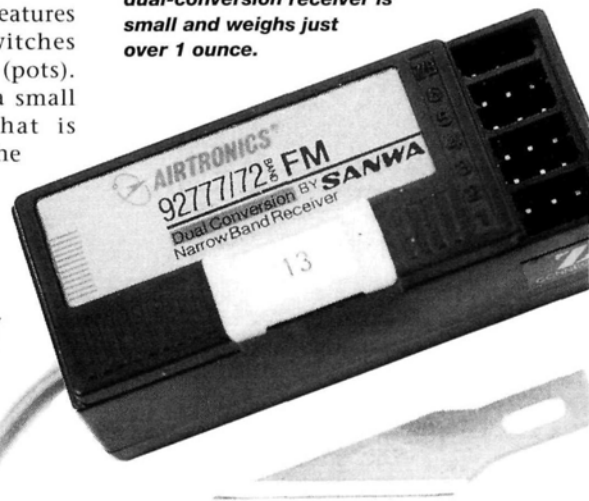
stored in a bracket attached to the transmitter antenna mast, so it's always available for any necessary adjustments. You can use the tool to reverse the direction of servo travel for each of the six channels with the flip of a tiny switch. In addition, EPA is available for throttle, elevator, aileron, rudder and flap channels. These adjustments affect both sides of the control at the same time. For exam-



The VG600 uses the same transmitter case as the Airtronics RD6000. Dual stick arrangement is set up as Mode II standard, but available in Mode I. EPA and servo reversing is controlled on the lower front panel of the case.

ple, let's designate full elevator control on either side of neutral as being at 100 percent of travel. At 100 percent travel, the elevator endpoint-adjustment pot is at its full, clockwise position. By turning this pot counterclockwise, you reduce the elevator servo travel to 0 percent (or close to it). Keep in mind that adjustments affect both sides of the servo output at the same time. In this example, both up- and down-elevator surface movement are gradually reduced at the same time. You cannot

The supplied Airtronics 7-channel 92777 FM dual-conversion receiver is small and weighs just over 1 ounce.





## AIRTRONICS VG600

establish more up than down, or vice versa. The exception to this EPA routine involves the throttle channel, where there are two separate adjustment pots provided for high and low throttle. This

### SPECIFICATIONS

**Name:** VG600

**Manufacturer:** Airtronics

**Type:** 6-channel, non-programmable radio available on all 72MHz aircraft RC channels; modulation is FM (on the high side, compatible with JR)

**Transmitter:** 1 lb., 10.7 oz., 6-channel dual-stick FM available as Mode II or I

**Receiver:** 1.1 oz.; 92777 dual conversion, narrowband FM with 7-channel capability (only six used for this application). Receiver complies with all current FCC regulations. Uses new Airtronics "Z" connectors (center pin is positive) plugged into side.

**Servos:** four, 94102 1.6-oz. servos with 50 oz.-in. of torque and 0.22-second transit time for 60-degree rotation; Airtronics "Z" connectors

**Accessories:** switch harness, 4-cell, 700mAh Ni-Cd battery pack with heat-shrink-wrap case, dual-output battery charger, aileron extension cable, servo-mounting hardware and extra output arms, frequency flag set and an instruction manual

**Weight (complete airborne pack):** 11.1 oz. (receiver, four servos, battery and switch harness)

**Street price:** \$180

**Features:** six channels, servo reversing for all 6 channels and EPA on all but the retract channel. Fifth and sixth auxiliary channels are nonproportional switch-operated. EPA for the aileron, elevator, rudder, high and low throttle and flap channels. The radio has ratchet-type trims.

**Comments:** the new VG600 offers sensible features that are easy to use. This is a good RC system for the rank beginner or for the average sport flier who is interested in a second or third radio that is very inexpensive. The RF module in the back of the case is not removable. Charging jack has a blocking diode so you have to remove the battery for cycling or testing purposes.

#### Hits

- Easy to learn and operate.
- Control-stick spring tension adjustable from the front panel.
- Easy trainer cable use.
- New Airtronics "Z" connectors now more in line with the RC industry.

#### Misses

- Transmitter crystal too easily accessible on front of case; swapping transmitter crystal is expressly forbidden by FCC regulations.
- No dual rates on elevator and aileron channels.

makes it very convenient to electronically set your high and low carburetor settings rather than labor over mechanical linkage adjustments. Keep in mind that the fifth, or retract, channel does not have EPA capability. The sixth, or flap, channel operates with a 3-position switch.

The fifth channel -retract switch is at the top left corner of the transmitter case. It is non-proportional and intended primarily for operating retractable landing gear but could be used as an on/off switch for an electric motor or accessory. The sixth channel lever is on the right side of the case. This is actually a 3-position switch that provides non-proportional channel operation. This switch has three servo positions that, as already explained, you can alter using the flap EPA. It would work well for flap control since you could have neutral flap, mid-range flap and full flap deployment using the three switch positions.

Battery voltage is not available at the transmitter's charging jack because of the usual blocking diode. But since the 700mAh, 8-cell Ni-Cd pack is easily accessed from the rear of the transmitter case, you can still hook up a battery tester or cyclor when you need to. Keep in mind that if you need to replace this battery pack, you can go up to 1400 NiMH cells, and they will fit in this same space.

A trainer cable jack is provided. You engage this feature with a push-button switch directly below the retract switch on the left top corner of the case. The trainer cable itself must be purchased

**The Airtronics new VG600 6-channel FM non-programmable RC system includes Ni-Cd batteries for TX and RX, dual-output charger, small receiver, four servos, an aileron extension cable and a switch harness.**



**The complete airborne components weigh a little over 11 ounces.**

separately (part no. 97100). The VG600's trainer system is compatible with the Airtronics VG400, Radiant, RD6000 and all the older Vanguard systems.

### THE RECEIVER

Airtronics supplies its popular 92777 receiver with the VG600 system. This light, dual-conversion FM receiver is relatively small at  $2\frac{1}{4} \times 1\frac{1}{2} \times \frac{1}{16}$  inches and weighs a little over 1 ounce. The 92777 has been on the market for many years and has a reputation as a very reliable performer.

The radio uses the new Z-type connectors. If you still have servos or battery packs with the older-style Sanwa connector, adapter cables will easily convert them from the old style to the new "Z" connectors and vice versa.

### AIRBORNE COMPONENTS

The supplied 94102 servos have a rated output of 50 oz.-in. and a transit time of 0.22 second for 60 degrees of rotation and weigh 1.6 ounces each. A 4-cell, 700mAh Ni-Cd airborne battery pack has heat-shrink-tubing wrap and weighs 3.2 ounces. The total airborne weight of the receiver, four servos, battery pack and switch harness is 11.1 ounces.

### SUMMARY

If you are looking for an RC system that is simple to operate, has basic control features and is available at a good price, the Airtronics VG600 is worth looking into. If you buy two of these systems along with a trainer cable, you'll have a perfect way to introduce friends and family members to RC flying.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. \**



## CONSTRUCTION

by Phillip S. Kent

*A first scale project that's easy to build and fly*



General Aircraft Corp.

# SKYFARER

**I**n the early days of aviation, stall and spin incidents were the number-one problem for general aviation pilots and accounted for many accidents and casualties. In the 1930s, much research was conducted by Fred Weick and the National Advisory Committee for Aeronautics (NACA) to solve the problem. Weick was given several patents for various stall-and-spin-preventing devices, some of which he incorporated into his light aircraft design—the Ercoupe. In the Ercoupe, rudder and aileron were coupled, and a large amount of dihedral added stability. For taxiing, however, it was realized that a steerable, tricycle landing gear was required in place of the controllable rudder.

Otto Koppen, the designer of the Skyfarer, used a different configuration to achieve his version of a stall- and spin-proof aircraft. His design included a steerable, tricycle landing gear, a high-wing cabin layout with side-by-side seating and a twin, fixed-fin design that eliminated the rudders altogether. This two-control (aileron and elevator) aircraft did what was asked of it, but it was somewhat underpowered. It had no rudder pedals, and many experienced pilots found themselves stomping on the floorboards in a vain attempt for more rudder input. As far as novice pilots go, however, it was proven that they could fly solo after only three or four hours of instruction—amazing by today's standards. Because of the war effort and the need for a more powerful engine, only 17 Skyfarers were ever built. Aircraft NC 29030, after which the Skyfarer is modeled, is now owned by Chris Cagle of Aviation Activities in Hemet, CA. Chris deserves much credit for his help in measuring the full-size aircraft and for supplying detailed information on it so I could build an accurate scale model.

## THE MODEL

This model is the second scale Skyfarer I have designed and built: the first was slightly bigger (70-inch span) and was built several years ago to the British Model Flying Association's light-scale-class rules. The model featured here is designed around the fine little O.S. .26 4-stroke engine, but if more power is desired, it is possible to fit a .40-size powerplant in the nose.

Construction is quite straightforward and consists of traditional balsa and plywood parts; it should present no problem at all to the enthusiast who has a couple of built-up models under his belt. Whenever I build a model from a plan, I like to cut out all the parts first and assemble a sort of kit before I actually commence building. Let's get started.



## SPECIFICATIONS

**Name:** General Aircraft Skyfarer

**Type:** cabin monoplane

**Scale:** 1/5.5

**Wingspan:** 68 in.

**Length:** 44 in.

**Weight:** 4 lb.

**Wing area:** 570 sq. in.

**Wing loading:** 16.20 oz./sq. ft.

**Engine req'd:** .25 to .52 4-stroke, .25 to .32 2-stroke

**Engine used:** O.S. .26 4-stroke

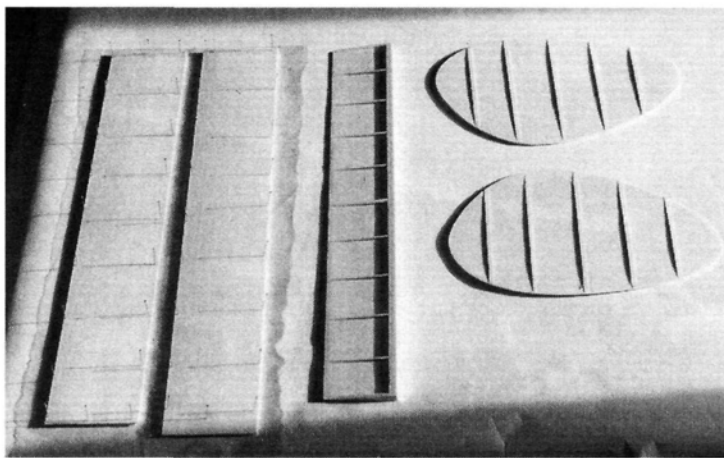
**Radio req'd:** 4-channel (throttle, aileron, elevator and nose-wheel steering); no rudder

**Comments:** designed by Phillip S. Kent, the General Aircraft Skyfarer is an unusual 1930s-era cabin monoplane. Its unusual twin-fin, no-rudder design was an early attempt at making a safe, stall- and spin-proof aircraft for general aviation pilots. In model form, this easy-to-build, lightly loaded aircraft is as easy to fly as a trainer, and it would make an excellent first scale model for anyone who can fly a basic trainer.



## THE TAIL UNIT

If you want to see results quickly, begin construction with the tail unit. The fins and elevator are fabricated using the very popular sheet-core method of construction. Trace the outlines of the fins and elevator onto  $\frac{1}{16}$ -inch balsa by placing the wood under the plans. Then with a pin, prick through the plan into the wood to show the shape of the part. Connect the pin-pricked holes in the wood with a pencil, then cut the core sheets to shape. The fins have  $\frac{1}{16}$ -inch ribs added to both sides of their core sheets, and these are sanded to an airfoil shape after they have been glued into place. The elevator is built in the same fashion; a  $\frac{1}{4}$ -inch square leading edge (LE) is glued to each side of the core sheet. The horizontal stab, built up without a balsa core sheet, has  $\frac{3}{16} \times \frac{1}{4}$ -inch spars, an  $\frac{1}{8}$ -inch-wide sub-LE and  $\frac{1}{16}$ -inch ribs. When the ribs have been sanded to shape, sheet the stab top and bottom with  $\frac{1}{16}$ -inch balsa. Cover the top first, and leave the stab pinned to the work board until the glue has dried. After



**Start construction of the Skyfarer by building the tail parts first. These are simple to build; the elevator and fins use  $\frac{1}{16}$ -inch balsa sheet cores with ribs attached to either side. The stab is built up and sheeted top and bottom.**

eliminate waste. Cut out the  $\frac{3}{16}$ -inch-square spar notches, and try to make the plywood rib template as accurate as possible before you cut out the balsa ones. The spar notches on the balsa ribs should fit the main spar snugly. The plans show the wing in two panel sections, but the wing is a one-piece structure, and you'll need to make up full-span-length spars before you start construction.

Start with the right wing panel, as it includes the center section details, and cover the plans with the clear backing from an iron-on covering material. Pin down the  $\frac{1}{16} \times \frac{1}{4}$ -inch rear spar directly over the plan, then pin in place the bottom  $\frac{3}{16}$ -inch-square main spar using  $\frac{1}{16}$ -inch sheet shims to elevate it over

the plan. Doing this allows the bottom LE sheeting to be flush with the bottom of the ribs when the sheeting is glued into place later on. Install all the ribs except the last two tip ribs, and be sure they all are glued into place at a 90-degree angle to the workbench. The center-section ribs are made from  $\frac{1}{8}$ -inch balsa. When the ribs are set, glue the  $\frac{1}{8}$ -inch sub-LE and top main spar into place. Then remove the structure from the work surface and reposition it so you can build the second wing panel over the single-piece spar and end up with a one-piece wing structure. Add the two tip ribs after the wing structure has been removed from the building board. To shape the wingtip, trim the last full-depth rib down  $\frac{1}{8}$  inch in height. Remove the material from the bottom edge of the rib and recut the bottom spar notch. Place the wing panel upside-down, install the trimmed-down rib and cut partly through the bottom spar and push it into place. Add the tip rib and the bottom

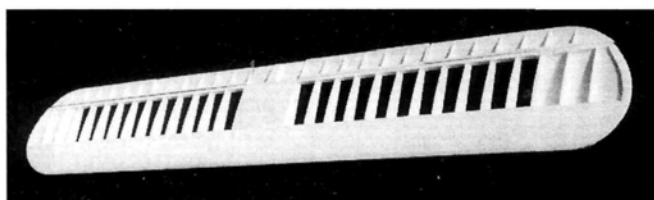
tip sheeting, placing it the full width of the cut-down rib and extending outward to form the outline of the wingtip. The overall shape of the wingtip should be roughly flat on the top and the bottom surface, sloping upward to the wingtip outline.

While the wing is still inverted on the workbench, shim up the rear spar, pin it down, and glue the bottom LE sheeting into place. When the glue has dried, turn the wing right-side up, pin the bottom spar to the work surface, and glue the top LE sheeting into place. Now, glue the  $\frac{1}{16}$ -inch vertical-grain shear webbing to the main spar. Make up and install the flap joiner wire, and then finish sheeting the top of the wing center section. Finish by adding the balsa hinge blocks as shown on the plans and then add the wingtip outline doublers. Carve the bottom tip of the rear spar to shape so it blends into the wingtip bottom sheeting. Now, sand the front edge of the wing straight, and glue the  $\frac{1}{4}$ -inch sheet LE into place; sand, carve and sand to shape after the glue has set. Finish the wing structure by making and installing all the plywood anchor points for the lift struts, the aileron bellcrank support plates and the aileron servo-mount rails in the wing center section.

Make the ailerons and flaps by pinning  $\frac{1}{16}$ -inch sheet to the plans, and then add the  $\frac{1}{16}$ -inch-thick ribs on top of the sheeting. Add  $\frac{1}{4} \times \frac{1}{16}$ -inch balsa to the top of the sheeting to form the LE, and sand the control surfaces to match the top contour of the wing ribs. (See rib cross-section details on the plans.) The flaps are bottom-hinged with small Robert\* HingePoint hinges, while the ailerons are center-hinged with regular flat hinges. The aileron control horn on my model is made from glass-reinforced plastic printed-circuit-board material and then epoxied into place.

## THE FUSELAGE

The fuselage is a simple box structure with  $\frac{1}{8}$ -inch stringers added to the outside to give the desired shape when covered. Cut the two sides from  $\frac{1}{16}$ -inch balsa sheet and add the  $\frac{5}{16}$ -inch-square longerons to the top and bottom edges followed by the  $\frac{1}{8} \times \frac{1}{4}$ -inch uprights and the lite-ply doublers. Do remember to make a left and right side. Glue formers F2 and F4 to one side, then glue the other side into place on top of the formers. Make sure the structure is square and straight. Pull the rear edges inward, and add all the cross members using the top view as a guide to maintain a straight fuselage. Bend the



**The wing uses D-tube construction and has no dihedral built in. Flaps and ailerons make up the entire trailing edge of the wing. There is no rib capstripping.**

the glue has set, lift it off of the surface, flip it over, and pin it back into place to sheet the bottom side. This ensures a straight, warp-free structure. Lightly sand the stab and add the  $\frac{1}{4}$ -inch LE, then sand it to shape. Note that both the stab and the elevator have  $\frac{1}{8}$ -inch-thick end ribs. Make the elevator control horn from  $\frac{1}{16}$ -inch plywood, cut a slot in the center of the elevator, and glue the horn into place as shown on the plans. This completes the tail unit.

## THE WING

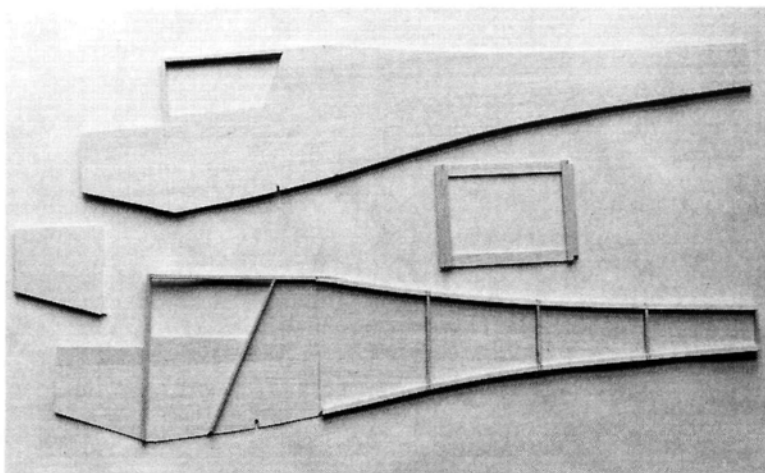
The Skyfarer's wing is unusual in that flaps and ailerons make the entire trailing edge of the wing, and the wing has no dihedral built in; it is flat. This does mean, however, that the wing is very easy to build. When I build a wing, I use a plywood rib template to help cut out all the wing ribs. This also allows you to lay out the rib positions on your  $\frac{3}{32}$ -inch-balsa sheet stock before you cut out the ribs to



## THE SKYFARER

main landing-gear wires to shape and encase them in the  $\frac{3}{4}$ -inch wide (3 layers of  $\frac{1}{8}$ -inch ply) laminated plywood structure shown on the plans. It is then glued into place between the lite-ply fuselage doublers. Make sure that the plywood landing-gear structure is positioned properly and at a right angle to the fuselage sides (see top view on plans.) Attach the nose gear to a plywood or hardwood block that is then glued to plywood former F2A.

Add the top, side and bottom balsa stringers to the fuselage as well as the  $\frac{1}{8}$ -inch balsa outside doublers around the cabin area. The tail cone is made from a soft balsa block and is carved and sanded to shape. Hollow the tail cone to save weight. Install the hardwood engine mount rails next and epoxy them to formers F2A and F2B. The engine cowl is easy to make. Fit formers F1, F2 and the  $\frac{1}{2}$ -inch-balsa inner-cowl parts together, and when everything is straight, glue them together. (Use epoxy on the engine rails.) Wrap the



*The fuselage is a very easy, box-type construction with few pieces. Stringers and external balsa doublers give the fuselage its final shape.*

formers with  $\frac{1}{32}$ -inch plywood, then add the front balsa cowl block, and carve and sand to shape. Use small screws to attach the cowl to the plane and glue small hardwood blocks onto the firewall to thread the screws into. On my model, I cut a square opening in formers F2 and F2A to allow the fuel tank to extend forward into the engine compartment. This makes it very easy to maintain the fuel system and hook it up to the engine.

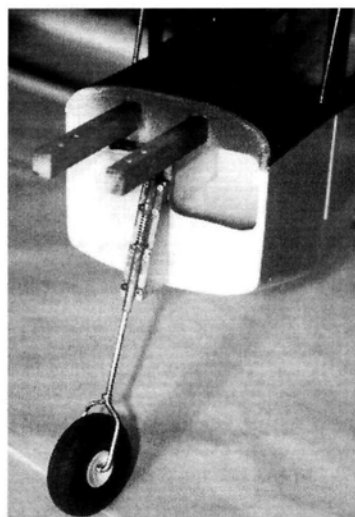
The nose gear is steerable and is mounted in brass bearing tubes. The photos in this article should be of some help, but basically, the nose wheel is  $2\frac{1}{2}$  inches in diameter, and the gear wire is  $\frac{1}{8}$ -inch music wire. The brass bearing tubes are soldered to flat sections of brass sheet that act as mounting tabs. The height of the nose gear is determined by soldering a washer to the vertical portion of the gear wire. A suitable spring is placed over the gear wire above this washer and in between the two bearing tubes. The stirrup-shaped portion of the gear that retains the wheel is made from a length of  $\frac{1}{8}$ -inch-i.d. brass tube that is bent to shape and soldered into place after the wheel is in place on the axle. For a sport model, this part can be omitted.

The wing lift struts on the prototype model were made from streamlined aluminum extrusion with  $\frac{1}{32}$ -inch music wire attachments inserted into the ends. Spruce struts shaped from  $\frac{7}{16} \times \frac{1}{16}$ -inch stock are shown on the plans and include simple sheet-brass attachment tabs inserted into each end of the struts. Holes in the mount tabs allow the struts to be attached to the wing with screws threaded into the plywood anchor points already built into the wing.

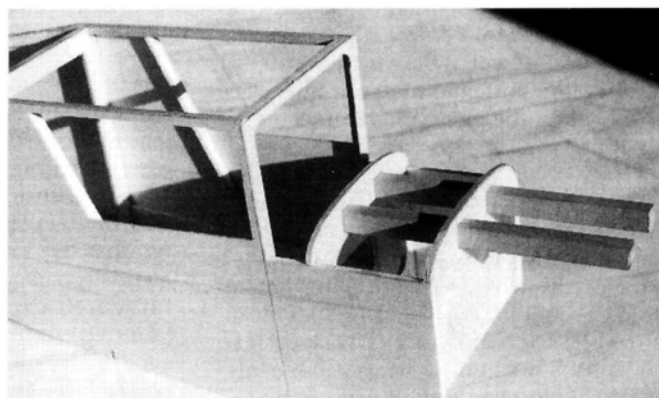
## FINISH

I covered the tail surfaces, ailerons and flaps with tissue that was doped on. The rest of the airframe is covered with an iron-on fabric material. I simulated rib

tape and stitching with strips of tissue and white glue applied with a toothpick. I sprayed the entire model with off-white dope and then masked off and sprayed the mid-blue trim. I cut all the letters and numbers from trim sheet and applied them by hand. Then I applied two coats of clear fuel-proofer mixed 80-percent gloss and 20-percent matte over the entire model. This gave a very realistic final finish. To make the clear windows and windshield, cut patterns of the final shape from stiff paper. Use the patterns to cut clear acetate sheet available from art- and graphic-supply



*The nose-wheel installation is relatively simple but must be scratch-built from music wire, brass sheet and tubes and a spring. Note the fuel-tank opening cut into the firewall.*



*This close-up shows the hardwood engine rails in place. The fuselage sides are simply cut from  $\frac{1}{8}$ -inch balsa sheet.*



## GENERAL AIRCRAFT CORP. SKYFARER

Introduced by the General Aircraft Corp. of Lowell, MA, the 2-place Skyfarer G1-80 was the second aircraft to be certified by the U.S. Aeronautics Board as "characteristically incapable of spinning." The high-wing monoplane had a D-tube spar of aluminum-alloy construction, a fuselage constructed with aluminum angle and channel sections assembled with riveted gusset plates. The wing aft of the spar, the fuse and tail components were fabric covered. Power was from a 75hp Lycoming 4-cylinder air-cooled engine, and the control system consisted of a single wheel-yoke to operate elevator and ailerons as well as the nose wheel, a single flap lever and a brake pedal.



# Astro Flight News

**Astro Flight Inc. Introduces five new and exciting products for the electric flyer: The new Mighty Micro 010 Brushless Motor for park flyers, a new Ducted Fan Brushless 05 Motor for the Kyosho T-33, FAI-035 and FAI-05 Planetary Motors for Sailplanes and two new surface mount digital speed controls.**

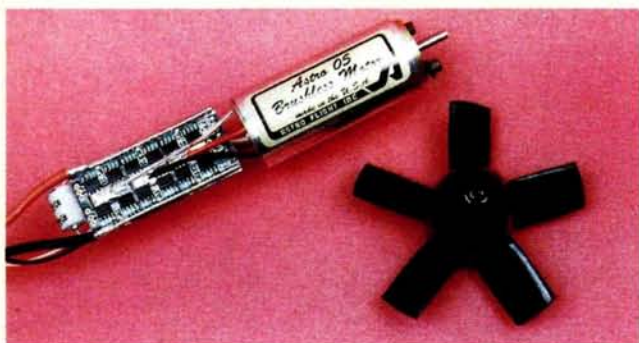
## The Mighty Micro is here!

Our new Mighty Micro Brushless 010 Motor #801 has arrived. The motor is one inch in diameter and one inch long and weighs only 35 grams with sensorless control. It spins an APC 6x2.8 prop at 9800 RPM while drawing only 2.5 amps from a six cell 350 mahr Nicad pack. Now you can fly for 5 minutes on Nicads, 10 minutes on Hydrides and one hour on lithium cells. The tiny On-Off Brushless control has Brakes and BEC. This system will work with 5 to 8 cell batteries. Perfect for models up to 10 oz.



## New Ducted Fan 05 Motor!

Our new 4 turn Brushless 05 Ducted Fan Motor #805F with 12 FET controller is specially designed to add Afterburner performance to the Kyosho T-33 and WE-Mo-Tek 480 ducted fan units. Run the T-33 fan on 8 or 9 Nicads or 10 Sanyo 3000 mahr Hydrides. The motor draws only 19 amps for 10 minute flights on Hydrides.



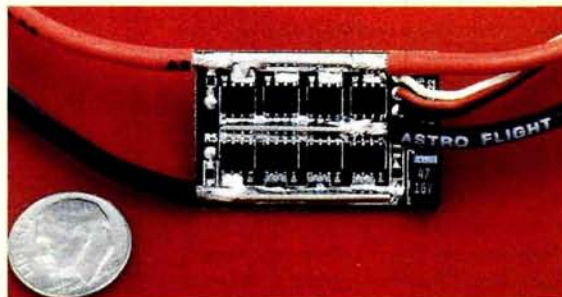
## FAI-035 with Planetary Gearbox

Our new 4.4:1 planetary gear box is now available for all Astro Cobalt 035, 05 and 15 motors. The FAI-035 with planetary gear box is perfect for 7 cell competition sailplanes. The FAI-05 with planetary gear box, shown here, is perfect for 10 cell sailplanes.



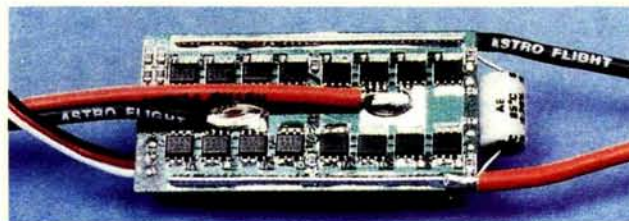
## New Astro 215D Airplane Control

The new Astro 215D Speed control uses new surface mount technology for minimum size and maximum performance. The tiny 215D weighs only 8 grams and has Brakes and BEC. It handles up to 30 amps and 10 cells. Perfect for Astro Cobalt 035, 05 and 15 motors.



## New 208D Reversing Control

The new 208D Reversing Control is designed for scale boats. It's 16 FET H-Bridge circuit gives you full power forward and reverse. The 208D weighs 1 oz and can handle 25 amps at 6 to 12 volts. It has a 2 amp BEC and a electronic current limit of 28 amps, so no fuses are needed. It was designed for tug boats and works great with 150 pound robots and electric powered blimps.





## THE SKYFARER

stores. Use a safe, white glue, such as Pacer Technology\* Formula 560, to attach the clear plastic to the model. Don't use CA.

Before you install the radio gear, check the model's CG balance point. It should be  $2\frac{3}{4}$  inches back from the wing's LE. Move the radio, servos and battery around until you balance the model at this point. Remember that lighter airplanes fly better, so do consider some of the new, smaller servos and flight packs on the market today. I also feel that the model would be ideal for electric power, though I have not experimented with this type of power source. Regardless of power source, keep the model as light as you can.

## FLIGHT PERFORMANCE

Because of inclement weather, it took a while to test-fly the original model. As luck would have it, when the weather cleared, I could not start the engine. I finally blew the glow plug and packed it in to go home. The problem was a stuck exhaust valve on my O.S. .26 4-stroke. A few squirts of oil fixed the situation, and I was again ready to fly. When the magic day arrived, the engine started on the first flip of the prop, and it ran beautifully.

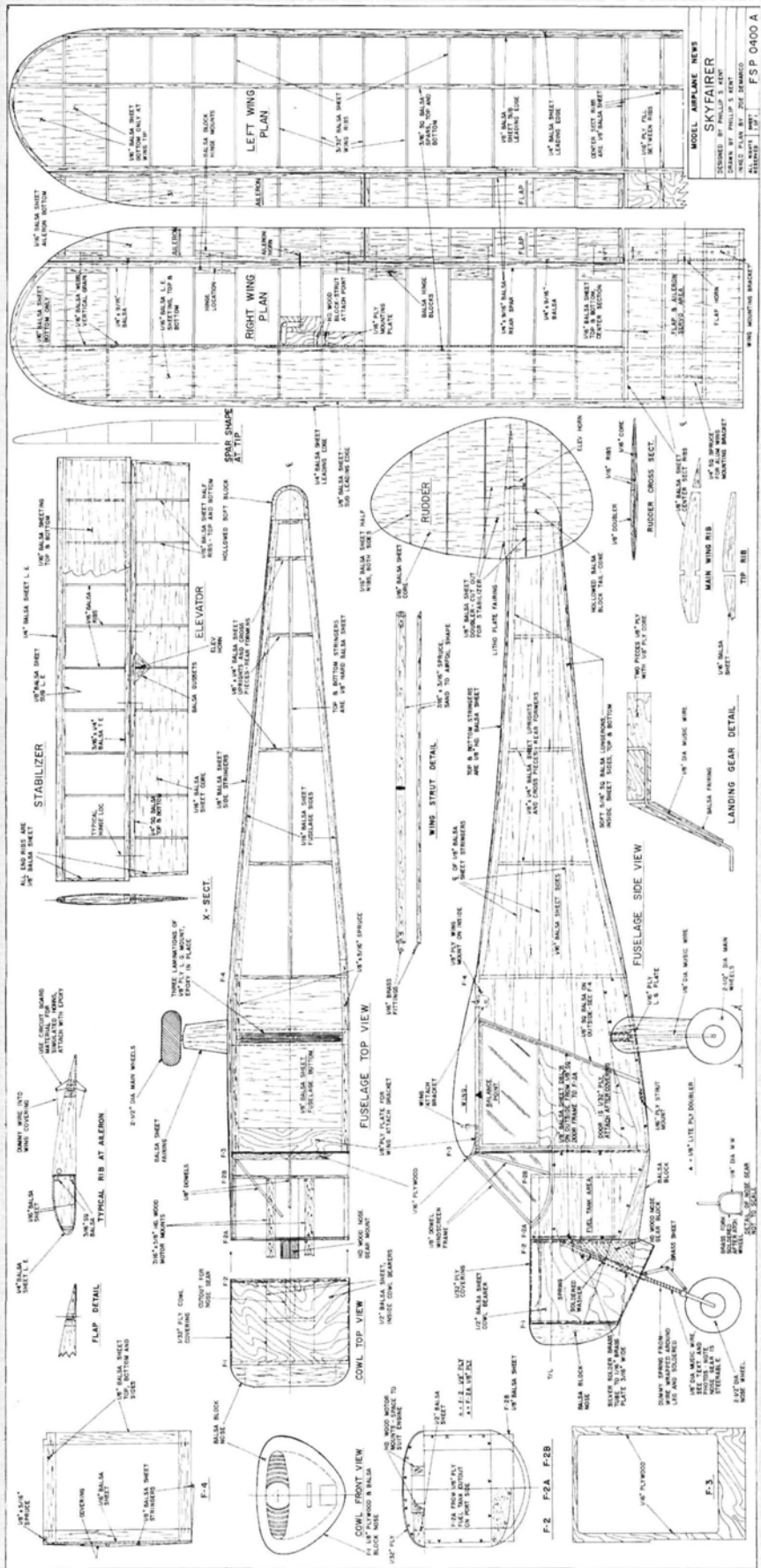
I opened the throttle slowly, and the nose gear made taxiing a simple task. The first liftoff from a grass runway was uneventful; there was plenty of power for a steady climb-out. The only trim changes needed were some up-elevator and a little bit of right aileron. The model is a delight to fly; it's more like a trainer than a scale model.

I tried the flaps, and they work very well; they do, however, cause a nose-up pitch change, but this is easily corrected with some flap/elevator mixing with a programmable radio. I made my first landing without the aid of flaps, and the model behaved well. Since then, however, I use the flaps in all light-wind conditions for a slightly steeper approach angle.

Not having rudder control, aerobatics are limited, but then again, the model is not designed or powered for this type of flying. Loops and rolls will need a slight dive before entry to gain the proper amount of airspeed; just keep your antics at a safe altitude.

The model is so easy to build and fly that I am sure Skyfarer would make an ideal first scale project for anyone who can fly a trainer. With its twin fins and no rudder, the Skyfarer is just the thing if you like "different."

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. †



**TO ORDER THE FULL-SIZE PLAN, FSP0400A, SEE PAGE 122.**





## Saito FA170R3

I've run so many engines over the past 29 years, I've lost count of them. Of those, I've loved many, felt others were OK, and even hated a few. Out of all of them, however, I think Saito's\* new FA170R3 3-cylinder, 4-stroke radial comes the closest to being "the perfect model engine" for the type and size of models I fly; that being aerobatic and Golden Age designs in the 6-foot to 80-inch wingspan category. Over the years, Saito

sons, less than practical as model engines. Some were outright clunkers. Maybe they were quirky to run, too heavy, low on power, or any combination of these. Obviously, the FA170R3 is an extremely interesting radial 4-stroke, but this one isn't going to spend its life on the mantelpiece; it's going to be a working, flying, model-aircraft engine. It has good power, weighs in at a respectable 48.96 ounces and runs like an absolute dream.

The engine uses three



*The beautifully crafted FA170R3 not only looks and sound great, it also has the power to "motivate" a model.*

has become my favorite sport/scale 4-stroke engine manufacturer, and the folks there have really outdone themselves with the FA170R3. They've created a truly beautiful machine in many respects. I know; some people might say, "For that price [the FA170 costs about \$800], anyone can produce a masterpiece." Well, let me tell you: it ain't so. There is an endless list of multi-cylinder engines that cost as much, if not more, than the FA170R3, and that were, for any one of a number of rea-

of Saito's FA .56 cylinder/head units with its hemispherical combustion chamber and valve arrangement. This is an off-the-shelf component that has proven, in the single-cylinder mode, to deliver excellent power and reliability. In typical Saito fashion, the six valve pushrods are driven by three camshafts whose spur gears mesh with a gear cut in the crankshaft. The carburetor is a two-needle type that worked great and was easy to adjust.

### RUNNING

I recommend that you replace the stock glow plugs with O.S. "F" types before you even start the engine—not that the stock units are bad; they're not. It just that the

### SAITO FA170R3 SPECIFICATIONS

**Engine name:** FA170R3

**Distributed by:** Horizon Hobby Distributors

**Warranty:** 3 years

**Displacement:** 1.70ci

**Hp:** 2hp @8,550rpm

**Bore:** 24.8mm

**Stroke:** 19.2mm

**Piston/sleeve:** AAC with ring

**Suggested rpm range:** 2,000 to 9,500

**Weight:** 48.96 oz.

**Width:** 7<sup>3</sup>/<sub>8</sub> inches

**Length:** 7<sup>1</sup>/<sub>2</sub> inches

**Firewall to thrust washer:** 6<sup>1</sup>/<sub>8</sub> inches

**Shaft diameter:** 10mm

**Street price:** \$799.99

#### Hits

- Good power, smooth operation.
- Good throttle transition; excellent idle; beautifully finished.
- Great sound!

#### Misses

- Limited instructions.

*All my readings are done with a TNC tachometer that measures in 10rpm increments. I feel it's simply the best, most accurate tach.*



### PERFORMANCE

#### Weather conditions:

Temperature: 48°

Relative humidity: 48%

Barometric pressure: 30.02

Zinger	.....14x8	.....10,100
APC	.....14x10	.....9,680
APC	.....15x8	.....9,550
APC	.....15x10	.....8,730
APC	.....16x8	.....8,560
APC	.....16x10	.....8,050
APC	.....16.5x12	.....6,940
APC	.....17x8N	.....8,230
APC	.....17x10N	.....7,330
Clark	.....18x8	.....6,160
Menz Ultra	.....18x10	.....6,590

All tests were done using 15-percent nitro Wildcat Premium Xtra fuel with 18-percent synthetic/castor (80/20) blend.





*The FA170 uses Saito one-piece .56 cylinder/head units. The sleeve's chrome plating is applied directly over aluminum—an expensive process, but excellent for cooling. Because the cylinder/head unit is borrowed from the .56, the bore for the 170 is the same: 24.8mm. However, the 170's radial crankshaft gives a bit more stroke than does the .56 single—19.2mm and 19mm, respectively. That's why the displacement of the 170 (1.70ci) is slightly more than the sum of three .56 singles (1.68ci). Note how the glow plug is placed slightly closer to the exhaust valve to help keep it hot and glowing.*

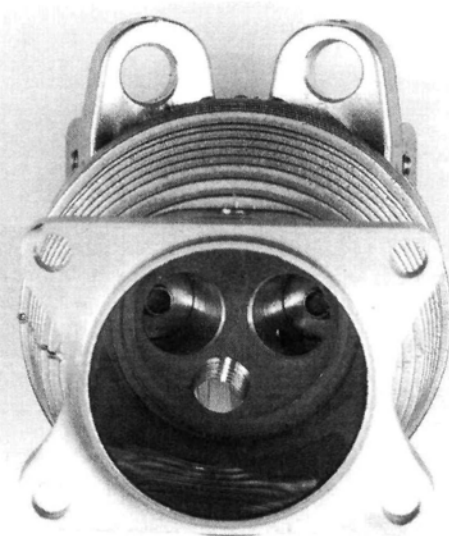
O.S. units are so damn good; better than anything else out there, in my opinion. With the O.S. plugs, you'll get a better idle, better throttle response and be less likely to have one of the cylinders go cold on you.

#### BREAK-IN

Saito uses its time-tested AAC (aluminum piston, aluminum sleeve, which is chrome-plated) technology. The twist here is that the piston is fitted with a ring. Seating a ring against hard chrome takes awhile, so I gave the FA170 a lot of break-in time, with a very rich setting, on the bench at 3,500 to 4,000rpm with cool-down periods. An APC 16x6 was used for most of the break-in. After about 45 minutes of this treatment, and with a bit a leaning out at the end of the process, I was ready to take some prop readings.

#### PROP SELECTION

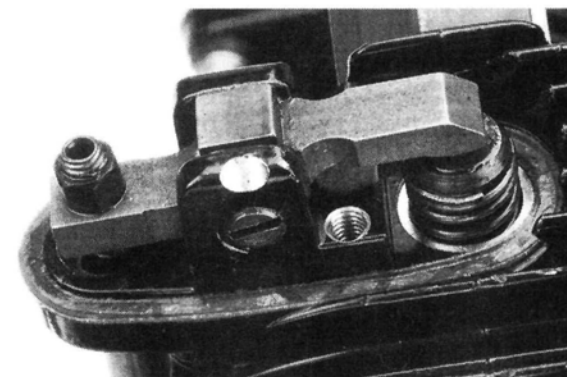
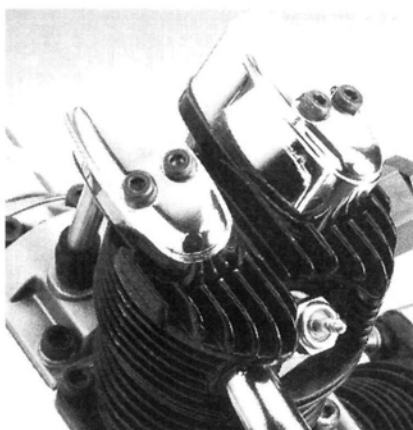
The bulk of my readings were taken with APC props. The scimitar shape has proven superior for models, and APC has an excellent reputation for consistency and balance.



On its website, Horizon Hobby (the distributor) recommends 14x8 to 16x8 props as the optimum range for this engine. To me, there's a bit of leftover 2-stroke thinking in these recommendations. The 14x8

is just too small to take advantage of what this engine has to offer. I recorded 10,100rpm on a Zinger 14x8. To my way of thinking, this is not the optimum range for this engine to be

*Rocker-arm covers are quickly removed with two Allen screws. A gasket keeps things sealed.*



*Left: easy access to the rocker-arm area will make it a breeze to adjust valve clearances, even with the engine mounted on a model. Right: the carb is a straightforward, two-needle type that gives excellent throttle response. The extra nipple on the side of the carb throat is for external priming tubing when the engine is buried in a scale cowl.*

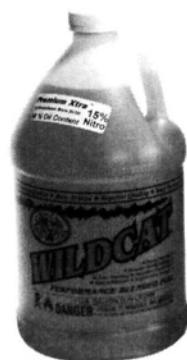
operating in. In fact, it contradicts the recommended rpm range of 2,000 to 9,500. Even the APC 15x8 edged out the recommended high-end range, turning 9,550rpm.

#### AN HONEST RATING

Some manufacturers make wild horsepower claims attained at impractically high rpm levels using props that are far too small for use on our models. Saito, on the other hand, claims a very conservative 2hp, which is exactly what I arrived at using an APC 16x8 turning 8,550rpm. I'm sure a higher horsepower rating could be recorded at higher rpm. However, I commend Saito for giving a horsepower rating that's firmly within the usable rpm range. Accordingly, the APC 15x10, 16x8 and 16x10 are all within the static rpm range you should be going for with this engine: 8,000 to 9,000rpm.

The nice surprise was the APC 17x8N (narrow). I tached 8,230rpm. You should allow for a 200 to 400rpm gain when the engine unloads in the air. It is interesting to note how the scimitar-shaped Menz Ultra 18x10 recorded a higher rpm reading than the conventionally shaped Clark 18x8. Obviously, all props are not created equal. I don't mean to imply that one is better than the other (that's another article); they're just different.

Anyway, in terms of power, the FA170R3 is somewhat equal to Saito's FA150 single—a very

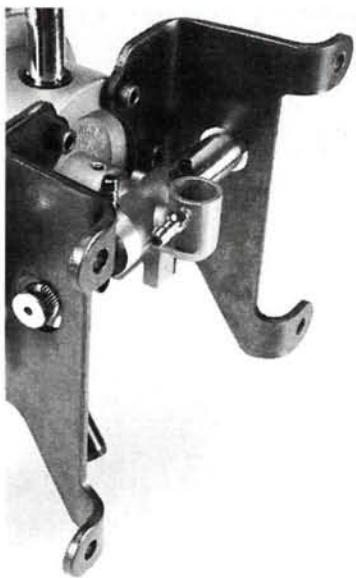


*3.6% of the 18% oil content in Wildcat's Premium Xtra fuel is castor. To date, I've found nothing that protects the internal part of a 4-stroke engine better than a touch of castor.*



powerful 4-stroke engine, to say the least. On an APC 15x8, the FA170 edges out the FA150 at 9,550rpm compared with 9,380rpm. As prop size increases, however, the FA150 catches up to and surpasses the FA170.

The handling qualities of the FA170 are, in a word, superb. Not surprisingly, the vibration levels are extremely low; almost non-existent, except for low rpm power pulses. Throttle response was very positive, with virtually no hesitation from low to high throttle, and the idle was quite impressive. On 16-inch props with no glow power connected, I had the engine holding a steady 1,500rpm with instant response to full throttle; those O.S. "F" plugs help here. Again, with no glow power and an 18-inch prop, I was able to get the engine under



**The firewall mount comes attached to the crankcase, and it should be a fairly easy undertaking to install the 170 on a model.**



**The teeth machined on the crankshaft drive the three camshaft spur gears. Note that the FA170 uses a master rod, as do full-scale radial engines. The slave rods are pinned to the master rod with hardened steel shafts and E-clips.**

an astounding 1,250rpm. Of course, this is pushing it for in-flight use, and anything below a 2,000rpm idle is fantastic. I'll bet that with onboard low throttle glow heat, this gem would idle at 1,000rpm after being well broken

in. The FA170 is a pure pleasure to operate. It even starts easily by hand with minimal choking in cool weather.

I guess you can tell I think Saito has

created a very special engine here, but you know what? I may have left out the most important part. That sound! It has that sound. It's a radial, and it truly sounds like one—because it is one! What more can I say? The next time you see this work of mechanical art, it will be flying its way through the pages of Model Airplane News—in Yellow Aircraft's\* beautiful, 73-inch wingspan Sukhoi. What a combination! I'll see you there.

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. \**

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# Convert a Power Kit to a Slope Soarer

by Dave Garwood



## Ducted-fan-to-glider metamorphosis

**I** HAVE WANTED TO fly an A-4 Skyhawk slope soarer ever since I saw a video of Steve Hinderks' scratch-built model performing on the West Coast. I wanted a large plane that looked convincingly scale—especially one with a prototypical delta wing, which not all slope-jet kits have. I got my chance when Yellow Aircraft International\*, a major manufacturer of RC ducted-fan jet kits, said it would support a slope-soaring conversion project and sell the parts of the ducted-fan kit that glider riders need and not the parts we don't need. Further, Yellow Aircraft offers both a 40-inch-span scale wing and a 45-inch "sport" wing. I ordered the larger wing.

To prepare a powered model for flight as a glider, you must modify the kit. Due to the size of this model and the complexity of the conversion, it is not a beginner project. But, if you've built a few foam and fiberglass models, and you are confident you can improvise while building, then you can do a ducted-fan-to-slope conversion. When you read about the

development, deployment and history of this amazing airplane, you may want to tackle the project. This article is designed to help.

### KIT CONTENTS

The A-4 arrives in two large boxes: one for the fuselage and the other for the presheeted wing and stab and the small plywood parts. The 65½-inch-long, polyester-resin fuselage is light and beautifully molded. Molded parts for the distinctive landing-gear fairings are also included as well as a clear canopy and a molded cockpit, in case you want to model these details.

The white foam-core wings and hori-

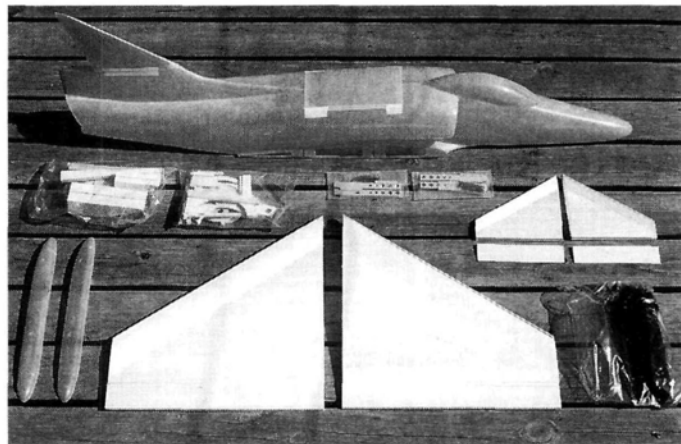
zontal stabs are sheeted with ¼-inch balsa, and the leading (LE) and trailing edge (TE) parts are already glued in place. The wing has servo wells and landing-gear wells routed out, and the landing-gear mounts are also built in. The vertical fin is molded, and the rudder is built out of plywood and balsa.

The instructions are average in terms of detail for a glider kit—22 pages with 35 photos and six drawings. They assume model-building experience but provide a logical building sequence and answered all the questions

I had about construction.

Note: there is an addendum of three pages and three 11x17-inch drawings in the complete instruction set. In particular, the angle of attack for the horizontal stab is increased for the 45-inch wing.

A molded avionics hump is available from Yellow Aircraft for those who want to build a later-model Skyhawk. The company can also supply a killer-detail cockpit kit, retractable-gear kit and an aluminum, plug-in wing-joiner kit.



Yellow Aircraft International's A-4 Skyhawk kit includes a molded-polyester and fiberglass fuselage and landing-gear fairings, sheeted wings and horizontal stabilizer, a bag of small balsa parts and a bag of small plywood parts. Shown also is an optional wing-joiner kit and optional molded plastic canopy and cockpit. An instruction booklet is included (not shown).



## MODIFICATIONS TO THE KIT DESIGN

The major changes needed to fly this plane on the slope save weight and increase strength wherever possible. For me, being able to disassemble the model for compact storage and transportation is important, so I modified the kit to make the wings and horizontal stabs removable.

In addition to not fitting the ducted-fan ducts and the motor mount, I did not cut the intake and nose-gear openings to preserve strength in the fuselage. I also decided not to cut the cockpit opening because fewer holes make a stronger fuse, and the painted canopy looks just fine to me. The landing gear was left off as well.

I knew from Bob Powers' conversion of an F-4 Phantom kit that larger ailerons would be necessary, so while retaining the original chord, I cut them full span. The elevator is stock, and the rudder on my plane is fixed.

The kit is designed to have the wing and horizontal stabilizer permanently mounted for lighter weight and greater strength. Working against the basic doctrines of good glider design, I modified the wing mount and the stab mount to make these parts removable and the model easier to transport.

## CONSTRUCTION

Fuselage construction is similar to that of any glass fuselage glider, except that it is a lot wider. The plywood formers provided in the kit fit in place as described in the instructions. I then used Pacer\* Poly-Zap CA and glassed the formers into place with polyester resin.

Since I was fitting full-span ailerons, I moved the aileron servos to the landing-gear mounts, so the servo arms and control linkages would be protected by the molded fairings. Then I filled the original prerouted servo-mount holes and the forward part of the landing-gear cutouts with expanding insulating foam, smoothing the foam with light spackle and capping it with fiberglass cloth and resin.

The wing-removal system relies on a pair of 1/8-inch, 5-ply birch spars set into each wing and bolted to "spar receiver plates" (also made of 1/8-inch plywood). These plates are glassed into the fuselage. The two forward spars are 1 1/2 inches tall and 9 1/2 inches long; the rear two measure 1 1/2 x 10 1/4 inches. Fix the spars into the wing halves with epoxy and secure them in the fuselage with eight nylon bolts that thread through the spar receiver plates and into wing nuts. I cut slots into the wing-cores for the spars with a hacksaw blade ground to a point, working carefully to extend the existing slots, which

were designed to receive the shorter spars provided in the kit.

The removable horizontal-stabilizer modifications use the two-wire system commonly seen in open-class sailplanes; my Skyhawk's stabs are fixed on two steel music wires, and pitch is controlled by the original elevator. This required cutting into the sheeted stabs to fit brass-wire receiver tubes and also fitting a balsa block inside the tail to lend strength where the wires pass through the fin.

The elevators are actuated via a pair of Carl Goldberg Models\* No. 280 nylon steering arms. One of these arms is mounted on each elevator; both arms are fitted to a piece of 1/8-inch wire that extends into the fuselage. Setscrews on these arms lock the stabs in place. I am indebted to Doug Buchanan for developing this system on his BAe Hawk slope-jet kit.

I spent 42 1/4 hours constructing the Skyhawk, and about a third of that time was spent in designing and building the removable wing and stab options.

## FINISHING

Real slope planes are painted, not covered. The final finish on all wood surfaces is light fiberglass cloth applied with HobbyPox\* Formula 2 and smoothed with a credit card under a heat gun. Simply sand, paint the primer coat, sand again and paint the final coat. Then you can sand, fill, prime and paint the fuselage and landing-gear fairings with spray-can enamel.

Because of the Skyhawk's long service life and variety of roles, its prototypes can be found in an abundance of color schemes. Light gray over white is the most common, but other color schemes exist; the Blue Angels flew the Skyhawk, and it also served in training squadrons, adversary squadrons and foreign air forces, and it has appeared in special Bicentennial colors.

I decided on the commonly seen "tactical gray over gloss white" color scheme. I used Testor's Model Master paint colors in small spray cans (no. 1929 Gloss Gull Gray and 1245 Gloss White for the main colors, and Model Master 1988 Euro 1 Gray for

## FLIGHT PERFORMANCE

Over a two-day period, I flew the slope Skyhawk four times from a steep 100-foot bluff at a lakefront site. In each case, there were winds of 18 to 22mph. The first launch went well with the plane rapidly gaining altitude, showing smooth pitch control but having hypersensitive roll control. It did require full back elevator trim to obtain level flight.

For each of the two subsequent flights, I took out some nose weight and reduced the aileron throw, which is easily accomplished on my JR\* transmitter using the travel-adjustment function. The plane handled better and better with each adjustment, but the day's flying ended with a bad landing and one set of stripped servo gears.

On the second flying day, the Skyhawk came into its own, now with 5 1/2 ounces removed from the nose and the CG moved back 1 1/2 inch, making the balance point 10 3/4 inches in front of the wing's trailing edge. I detuned the big ailerons with 50-percent rates and 75-percent exponential set into the transmitter. The plane now flies well; straight and level flight is smooth and

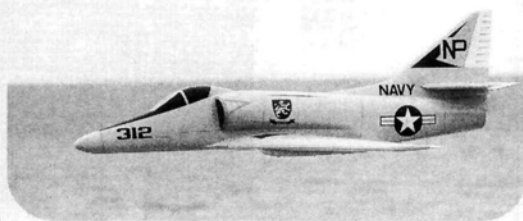
steady, high-bank pylon turns are easy, and rolls are quick and axial.

I did not have a chance to try extended inverted time or loops, because I hit terra firma flying in close for the camera. But the damage was limited to a broken wing joiner, broken off horizontal stab

tips, cracked formers, another stripped servo and dings in the fuselage. It will fly again!

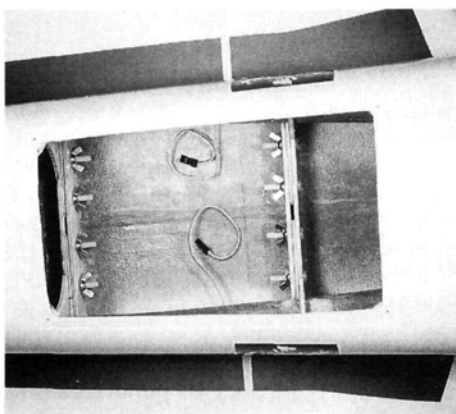
My Skyhawk flies slowly—most likely a function of the

high frontal area and, more important, its low wing loading and fairly thick, semisymmetrical airfoil. If I were to build it again, I would not hesitate to use the included lite-ply formers as patterns to make stronger ones. I would also provide for a pound or more of ballast, or alternatively, reinforce the fuselage with glass cloth applied to the inside with polyester resin. Since weight is not a problem on this conversion project, the model can easily bear the weight of standard servos for the ailerons, and they might be more resistant to landing damage on this low-wing plane.

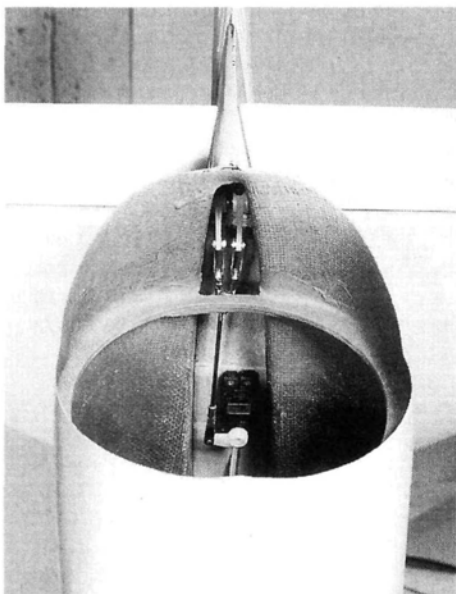




## Convert a Power Kit



Dave's wing-joiner system for removable wings. Each wing half has a pair of 1/8-inch-plywood joinder blades clamped between 1/8-inch-plywood receiver plates with nylon bolts and wing nuts.



View looking up into the tailpipe at the elevator servo and elevator linkage. The removable links are Carl Goldberg Models no. 280 Nylon Steering Arms, which clamp to elevator torque rods with setscrews.

the wingwalk and the engine intakes).

The markings came from Sig Mfg.\* stars and bars sheets, Byron Originals\* decals and cut vinyl lettering made at a local sign shop.

Finishing the sanding, painting and markings took me 19 3/4 hours.

### RADIO INSTALLATION

On a project like this, radio reliability is essential. I used JR\* equipment throughout. While this airframe has plenty of room for radio gear, I wanted to keep my model light, so I installed a JR R600 "credit card" receiver, a pair of JR NES-341 servos in the wings and a JR NES-3021 mini ball-bearing servo for elevator control. The JR/Sanyo 1200mAh battery pack is pretty hefty for a glider, but the nose weight might as well be nickel-cadmium instead of lead.

The aileron servos are located in the

## A BRIEF HISTORY OF THE PROTOTYPE

The Pacific theater of WW II demonstrated the effectiveness of the aircraft carrier, starting with the attack on Pearl Harbor. WW II included the first naval engagement where the opposing forces did not come within gun range or sight of each other (the Battle of the Coral Sea). All of the damage on ships of both sides was inflicted by carrier-borne bombers and torpedo planes.

The Korean War saw Vought Corsairs and Douglas Skyraiders fly from "a floating piece of real estate" and attack ground targets and support ground troops on a faraway peninsula. By the beginning of the Cold War, aircraft carriers and their squadrons of aircraft had replaced battleships as the favored method for projecting a nation's military power across the sea.

Entering the jet age in 1952, the U.S. Navy issued specifications for a carrier-borne attack bomber that would be capable of delivering a heavy load, reach 495mph and have a maximum weight of 30,000 pounds. Ed Heineman, chief engineer for Douglas Aircraft in El Segundo, CA, delivered a design that met all of the Navy's requirements, and incredibly, at 11,200 pounds it weighed less than half of the maximum specified weight.

The diminutive A-4 Skyhawk could carry more than its own weight in underwing stores. The innovative delta-wing planform yielded a short span that could be handled on and under carrier decks without the use of folding wings; this was one of the secrets of saving

weight and reducing mechanical complexity in the design. Moreover, a Skyhawk set a closed-course world speed record of 695mph, exceeding the original specifications by 200mph. The A-4 was the first attack aircraft to set and hold a speed record.

Known to the design team and Douglas test pilots as "Heineman's hot rod," the A-4 was affectionately nicknamed "Scooter" by Navy and Marine pilots as well as flight and deck crews in recognition of its small size and great



agility. It handled wonderfully in the air and was easy to fly because of the excellent placement of instruments and flight controls.

This little plane could pack a wallop, carrying a wide variety of weapons up to and including an A-bomb. When compared to its compatriot F-4 Phantom, A-6 Intruder and A-7 Crusader, some have called the Skyhawk the most important attack aircraft flown by the U.S. Navy and Marines during the Vietnam conflict.

Skyhawk production was expected to last from 1954 through 1959, but the Douglas production line stayed open until 1980. Because export versions of the plane were sold to Argentina, Australia, Brazil, Israel, Kuwait, New Zealand, Malaysia and Singapore, modelers have a wide variety of color schemes from which to choose.



Finished Skyhawk with paint and decals, but before panel lines.

wing's landing-gear cutouts and are connected to a single radio channel via Y-cable. The elevator servo is mounted in the tail and is connected to the receiver via a long extension cable.

With the big 1200mAh battery pack in the nose, I only needed to add 7 1/2 ounces to balance the plane at the recommended CG. My plane weighs 87 1/2 ounces ready to fly and has a wing loading of 19 2/5 ounces per square foot. I set my aileron throws at 1 1/2 inches up and 1 inch down. The elevator throw was 3/4 inch up and down.

Is a conversion project like this worth the time and effort involved? I think so, and it certainly creates some excitement when it's launched on the glider slope.

\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ✈

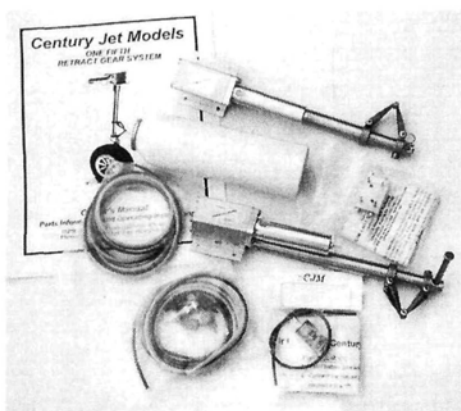




## Installing retracts in a foam wing

Installing retractable landing gear in a foam wing is an easy task if you have the experience. But, what if you have previously built only wood models? After all, what might seem simple to one guy could be a daunting task for another. It all depends on experience and building skills.

This month, let's look at putting retracts in a foam wing and then touch on sheeting it. These are traditional construction techniques, but many readers who are new to them will gain some insight. So, let's get to it.



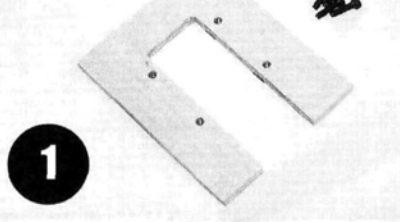
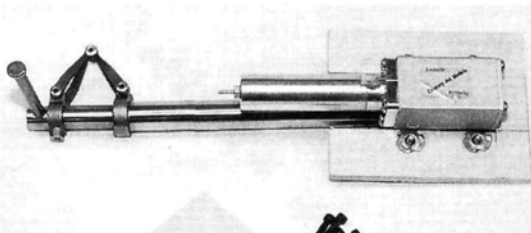
The retracts I'm installing in my Bf-109 are these sturdy units from Century Jet Models\*.

### FOAM CORES AND RETRACTS

The technique for properly installing retracts in a foam-core wing can best be demonstrated with my new, Meister Scale\* 84-inch-span Bf-109. This kit comes with the foam cores already cut, and they are shipped in foam saddles to prevent damage. The plans show the basic layout of the wing parts and the location of the plywood mount plate, but much is left for the builder to work out.

Foam wing-cores cut using the hot-wire process have a surface that requires smoothing with a large, flat sanding block and 100-grit sandpaper to make it ready for sheeting. Use either a Great Planes\* sanding bar or a 3x12-inch piece of 3/4-inch plywood; don't hand-sand the foam.

Vacuum the cores after you have sanded them and replace them in their foam saddles. The Meister 109 kit includes sheets of 4x42x1/8-inch balsa to make up the wing skins. Trim the long edges of the sheets with a hobby knife and a straightedge; then glue four sheets together to make a 16x42-inch sheet, as explained in the following section. You'll need four of these big sheets



Start by making the plywood mounting plates, then use blind nuts and cap-head screws to attach the gear to them.

to completely cover the wing.

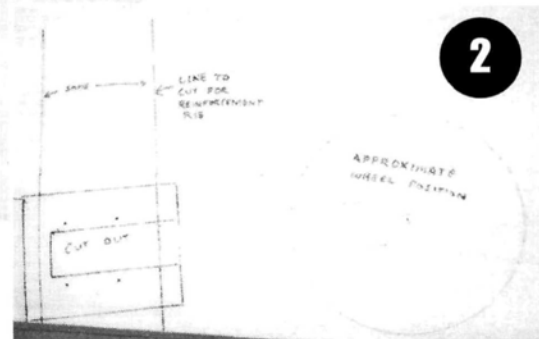
Tape the 4-inch-wide sheets together before gluing them with aliphatic resin glue. I use Pica\* Gluit. Once the sheets are taped together, move them slowly toward the edge of your workbench until the first three pieces hang over the edge. Run a bead of glue along the open seam; when it is full of glue, pull the sheets up onto the bench top. Note that, as you pull each sheet up, its seam closes like a book. Repeat these steps on the other two seams, pulling the sheets up onto the bench as you go. Once the entire sheet is glued, use a wet sponge to remove the excess glue.

Cover the bench top with wax paper and place the sheeting down with more wax paper on top, then place a weighted board over all; let the glue dry for at least 24 hours. The next day, remove the weight and pull off the top piece of wax paper. Flip the sheeting over, remove the tape and let it dry for another 24 hours. Then sand both sides with a 100-grit sanding block. This will smooth out any high spots on the sheeting. Now make the other three sheets in the same way and set them aside where they won't get dented or dinged.

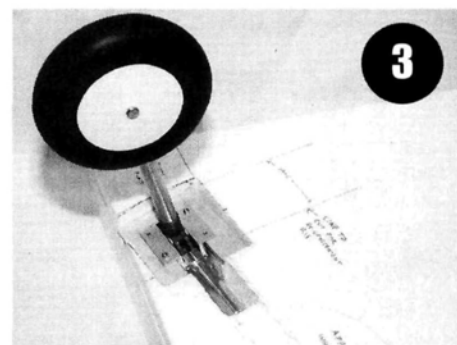
### DIGGING FOAM

To make room for the retracts, you must remove unwanted foam from the wing-core. I use an old Sears/Craftsman soldering gun with a bent piece from a coat hanger as a cutting tip. Before you work on your wing, practice on a piece of scrap foam because the gun melts foam very

quickly. A retract installation must be lightweight and installed in a foam wing with enough strength that it will resist being pulled out during a hard landing. (I make a 1/4-inch plywood plate to mount the retract gear that's large



Use your plans and scale 3-view drawings to determine the proper location of your gear. Use a felt-tip pen to draw the location of the mount plate, strut and wheel on the foam core.



Here, the mount plate and gear have been placed in the cutout in the foam core. Check the gear's angle relative to the wing and make sure it is correct. Take your time.

enough to provide a generous point of attachment to the foam. The mount plate shown with my wing is approximately 4x3 1/4 inches.)

Attach the retracts to the plate with blind nuts and cap-head screws; then use the entire assembly to lay out the gear's position on the foam wing-core. Do your measuring on the plans and check your scale 3-views to accurately determine the gear's position on the core. Then draw the gear position on the core with a felt-tip pen. When everything is correctly laid out, draw the mounting plate outline on the core.

Using a foam-cutting tool, cut away the unwanted foam. Take your time while



doing this; don't try to remove a lot of foam in one pass. You can also use a file or a razor knife to cut away any foam that's inaccessible to the foam-cutting tool.

The landing gear of the Bf-109 is, at best, difficult to install because of the compound angles involved in its gear geometry. When extended, the gear legs are angled forward, placing the wheel slightly forward of the wing's LE; retracted, the gear sweeps back toward the TE. I do not recommend a Bf-109 for a first attempt at installing gear in a foam wing.

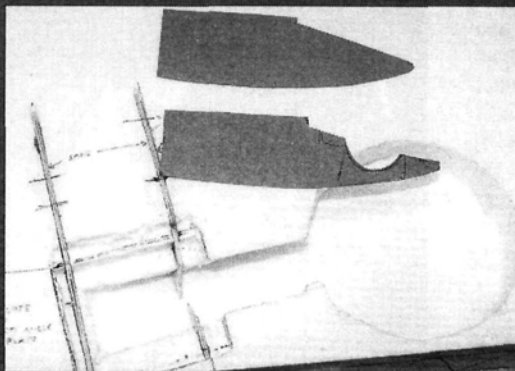
After you remove all the foam, place the mounting plate and gear in the recessed area and examine the fit. Check to make sure the extended gear angle relative to the wing is correct. If not, adjust the fit and, if necessary, recut the foam until it is correct; this may require a lot of trial and error. Once you have the extended-gear position correct, "collapse" the gear to check its retracted position against the wing panel. Cut the foam away from the strut and wheel-well areas and check the fit again. Cut the wheel-well and gear-strut areas a bit wider than is needed to fit the gear. The extra room makes it much easier to add internal walls and well floors.

I often treat my first wing panel as a "sacrificial lamb"; the second panel turns out much better than the first because of the lessons I learned. Do not worry if your first attempt is rather clumsy; when you sheet the wing and finalize the installation, small internal deviations won't be noticed.

#### HALF-RIB SUPPORT

To add strength to the retract installation, install two plywood half-ribs to spread the load. Use a straightedge and draw two, 6-inch-long lines, approximately  $\frac{1}{2}$  inch in from each edge of the mount plate; then remove the gear, and use a bandsaw to cut into the panel along these lines. Make the cuts about  $\frac{1}{8}$ -inch wide. The ply ribs fit into the slots and will support the mount plate. To determine the shape of the ribs, insert a piece of thin cardboard into the slot and trace the shape of the foam core with a pencil. Note that the front of the ply ribs will be glued to the mount plate, so make sure to mark the notch accurately on the cardboard. Remove the cardboard from the slots, cut them to shape and use them as templates to cut the plywood ribs. Install the ribs in the slots and check their fit and position. Adjust the ribs if needed, or cut new ones, until everything fits perfectly.

Place the wing-core back into its foam saddle and use 30-minute epoxy to glue the ribs into the panel. First, place wax paper under the panel to prevent it from being glued to the foam saddle. Put the mount plate in place to check the fit, then

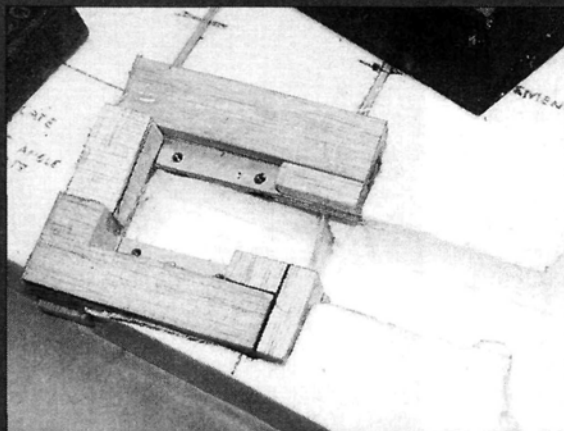
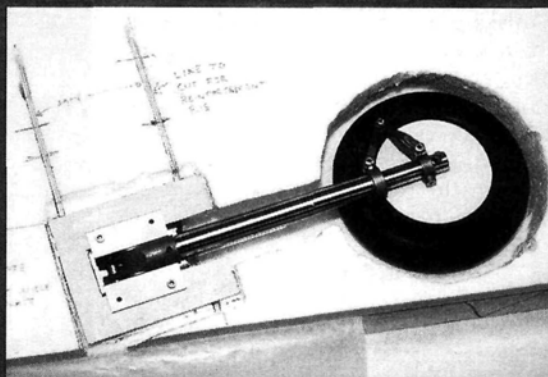


4

Here are the cardboard templates I used to make the plywood half-ribs that support the gear's mount plate. Note that the plywood ribs are in their respective slots.

5

Cut away the foam until the gear can be placed in its retracted position. When everything is properly aligned, remove the gear and epoxy the plywood ribs into place. After the ribs have been glued into place, epoxy the mount plate onto the ribs.

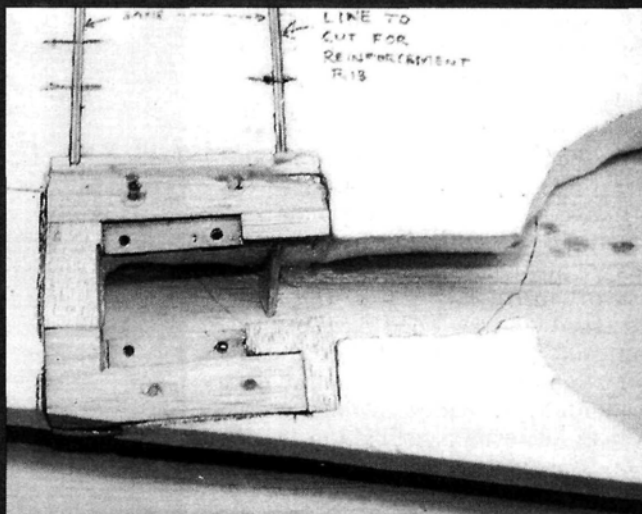


6

The area between the bottom of the mount plate and the outer surface of the wing-core must be filled in. Here I've glued balsa blocks to the plate, leaving room for the retract unit to be installed.

7

The balsa blocks have been cut and sanded to match the contour of the foam core. The wing-core is ready to be sheathed.





let everything cure overnight.

Next morning, epoxy the mount plate into position, making sure that it is also glued to the plywood ribs. When the glue sets, drill two or three holes through each side of the plate so you can insert  $\frac{3}{16}$ -inch dowel lengths through the mounting plate and into the foam. Then epoxy the dowels into place and trim them flush with the top of the mount plate. The dowels serve to further anchor the plate into the wing, greatly increasing its strength.

When the glue sets, bolt the retract unit back into place and then glue balsa wood blocks to the plate, filling the open space around the retract unit. The blocks fill in the missing area between the plate and the core's outer surface. Remove the gear and cut and sand the blocks to match the contour of the core. This leaves an opening just big enough to remove and replace the retract unit. Once it's covered with the wing skin, the installation will look neat and professional.

## SHEETING THE WING

With all the retract mount pieces installed, the panel is ready to be sheeted. Pacer Technology's\* Z-Poxy finishing resin is the best adhesive I have found to sheet foam wings with. When the two components of the resin are mixed together, it becomes very easy to spread using a squeegee. First apply the resin to the foam core, making sure to cover the entire surface; then apply resin to the balsa sheeting and cover the inside surface that will be above the retract mount plate and wheel well with a 6x12-inch piece of  $\frac{3}{4}$ -ounce glass cloth. The glass cloth absorbs some of the resin, so add resin to the cloth before putting the balsa sheeting on the core. Sheet both the top and bottom surfaces of the core in this manner, then place the entire wing panel back in its foam saddle.

Place the top saddle on the wing panel. Then, while making sure the sheeting doesn't move out of place, put a board on top of the wing panel and add weight (bricks) to hold the core and sheeting together. Make sure that the leading and trailing edges are straight, then let the entire wing structure set up overnight.

Remove the core from its saddle and trim the balsa sheeting flush with the core's leading and trailing edges. Cut the balsa to within  $\frac{1}{16}$  inch of the foam edges, then sand the wood even with the foam. Add the LE and TE to the wing using aliphatic resin, and tape them in place until the glue dries. While it is drying, place the wing panel back in its cradle and weight it down to make sure it remains straight.

After the glue dries, put the panel in its saddle upside-down and slowly remove the



8

The balsa blocks have been cut and sanded to match the contour of the foam core. The wing-core is ready to be sheeted. After taping the 4-inch-wide balsa sheets together, place them on the bench top and let them hang over the edge. The tape acts as a hinge and allows you to easily apply glue to the seam. Use aliphatic resin glue, as it is easily sanded.

9

Use a damp sponge to remove excess glue from the sheeting. Place wax paper under and over the sheeting, weight it down and let dry.



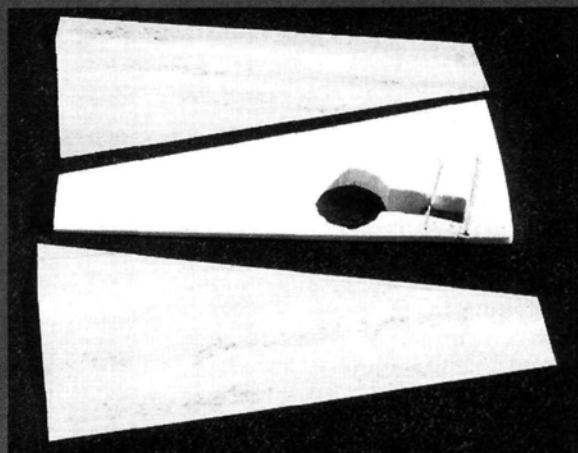
10

Use a 3x12-inch piece of plywood with 100-grit sandpaper glued to it to sand the sheeting smooth. Flip the sheet over and sand the other side as well.



11

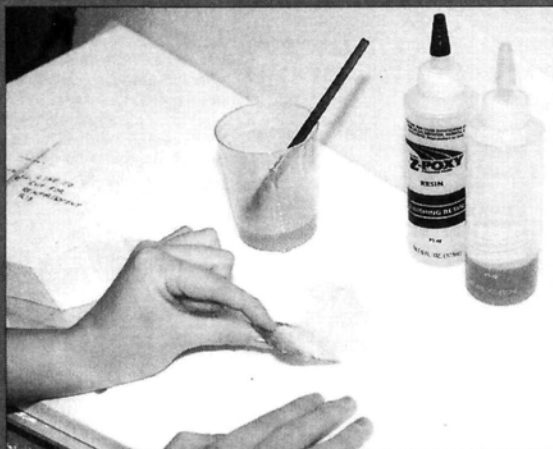
The foam core and the sheeting are ready to be glued together. Cut the sheeting slightly oversize all the way around the core.





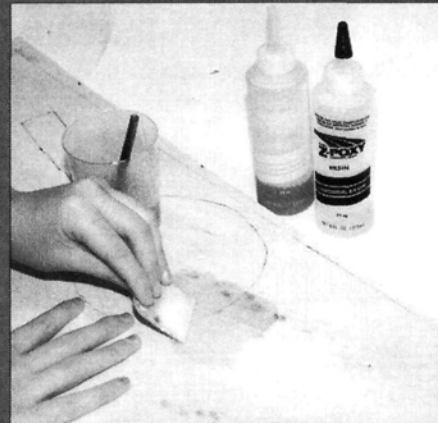
12

*I use Z-Poxy finishing resin to bond the sheeting to the foam core. Z-Poxy is easy to apply with a squeegee.*



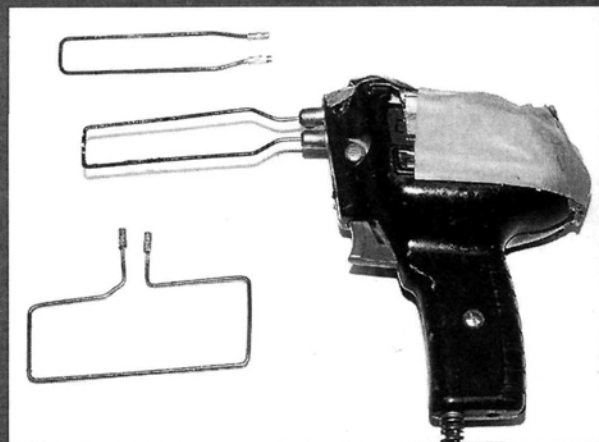
13

*Though you can't see it in the photo, I apply fiberglass cloth to the underside of the balsa sheeting that is located over the retract unit and wheel well; it adds strength.*



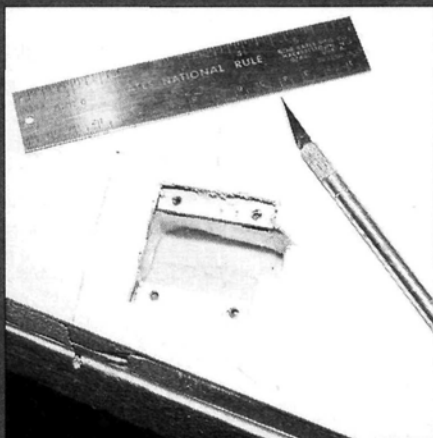
14

*Place the wing-cores and sheeting into the foam saddles, then stack weights on top to press everything together. Let cure for 24 hours.*



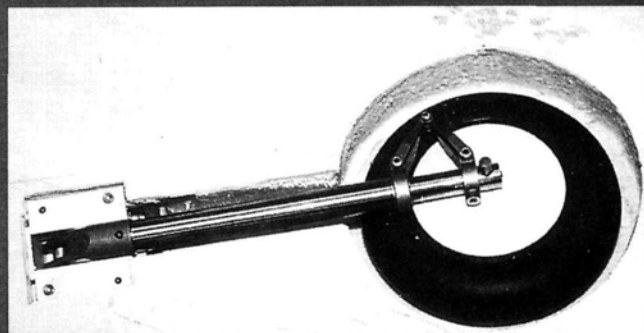
15

*This is what my homemade foam cutter looks like. The wire is from a coat hanger.*



16

*Cut the wood away from the gear's attachment point and work outward.*



17

*When you bolt the gear back into place, cut the sheeting away from the strut area and work outward to the wheel well.*

sheeting from the area above the mount plate of the wing with a razor knife. Work outward until the opening is big enough for the retract unit to be bolted to the mount plate. Using the strut as a guide, cut the sheeting outward to the wheel well until the strut and wheel can drop into

place. Take your time and make the opening as neat as possible.

The bottom and sides of the wheel well should be lined with  $\frac{1}{16}$ -inch sheet balsa to strengthen the wing and give it a finished look. If you use CA glue, use it sparingly, as it can melt the foam if it seeps under the wood.

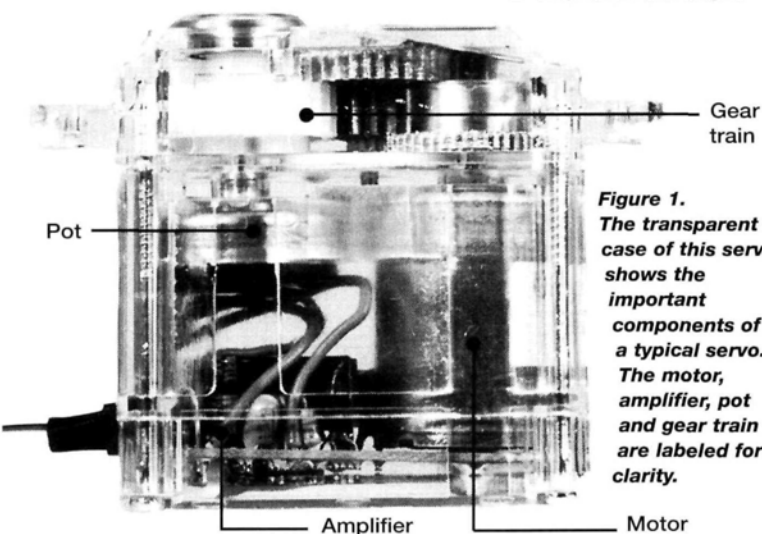
Hey, that's about it! Now follow the same steps on the other wing panel, and you'll be ready to join the two panels into a completed wing. Good luck!

*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. ★*





## Actuator academics



**Figure 1.** The transparent case of this servo shows the important components of a typical servo. The motor, amplifier, pot and gear train are labeled for clarity.

A servo is a masterpiece of engineering. Weighing only a few grams or ounces, it can provide several pounds (newtons!) of push or pull immediately after you issue a command from the transmitter. Servos can be mounted in any orientation, and they only require a three-wire connection to the receiver.

How do these marvels of technology work? Figure 1 shows the inside of a typical servo. As you might expect, it has both mechanical and electrical parts: the motor, electronics, feedback potentiometer (often called a "pot"; a variable resistor that senses the position of the output gear), gear train and case. All of these parts work together to make the servo move on command. Here's what each part of the servo does:

Through a set of reduction gears to increase its torque, the motor provides the power to move the servo arm against a load. At the other end of the gear train is the output gear, the thickest and slowest-turning gear. The servo arm is connected to the output gear and moves the control surface on the model. It's important to know that the output gear is also physically connected to a pot.

The pot is there to sense the output arm's position so that it can be sent to the servo amplifier ("amp"). About 60 times each second, the servo amp compares the commanded position signal (from

the receiver) to the servo arm's actual position. If the arm is not where you command it to be, the amp commands the motor to move the output to the correct position. The amp will apply the full power of the motor to move the servo arm even when the arm is very close to the commanded position.

The schematics of servo operation are shown in Figure 2. You can see the "feedback loop," which is the key to accurate, high-speed motion. ("Feedback" means that the position of the servo arm is measured and fed back to the electronics so that the proper command to move may be given.)

### CHECK OUT YOUR SERVOS

Even if all of your servos seem to be in perfect condition, it's not a bad idea to check them before installing them in a model. I use the ElectroDynamics\* Servo-Ciser, but you can buy servo cyclers from several places. Servo cycling capabilities are also



A servo exerciser such as this "Servo-Ciser" from ElectroDynamics may be used to cycle the servo slowly or quickly back and forth to check for problems.

built into high-end RC systems, such as Futaba's 9Z. You can also manually test a servo by slowly changing the amount of subtrim on a computer transmitter or by very slowly moving the transmitter stick from one side to the other.

I usually cycle each of my new or repaired servos for 10 to 15 minutes in both "slow" and "fast" modes. In the slow mode, the servo is commanded to move very smoothly from one end to the other about once each second. The fast mode commands the servo to move as fast as possible from one end of its travel to the other, stop, and then go back again and again.

The slow mode is good for finding bad gears or motors—especially if you provide a little resistance with your fingers. If you feel a slight hesitation at any time, it could be a broken tooth on a servo gear (you'll learn how to fix this in my next column). If the servo stops completely, it may have a motor with a "dead spot."

A dead spot occurs where the armature of the motor does not make good contact with the brushes. Sometimes, tapping on the servo will make it run again, but sooner or later, it will cause a crash. (Dead spots are particularly dangerous on sailplanes because of the lack of vibration that can sometimes get the motor to rotate enough to make contact.) The best thing to do if you suspect a dead spot is to immediately remove the servo from the model, tie a knot in the connector wire to remind you not to use it and have the servo motor replaced. Motors with dead spots are rare, but they do occur occasionally.

### INTERCHANGING SERVOS

With the variety of servos now available, you may be interested to know that different brands are electrically interchangeable. Just be sure that the wires are hooked up properly.

If you want to swap servos between differing receiver brands, in some cases, you can plug them in without modifications. Table 1 provides the requirements for

Table 1. Servo interchange information

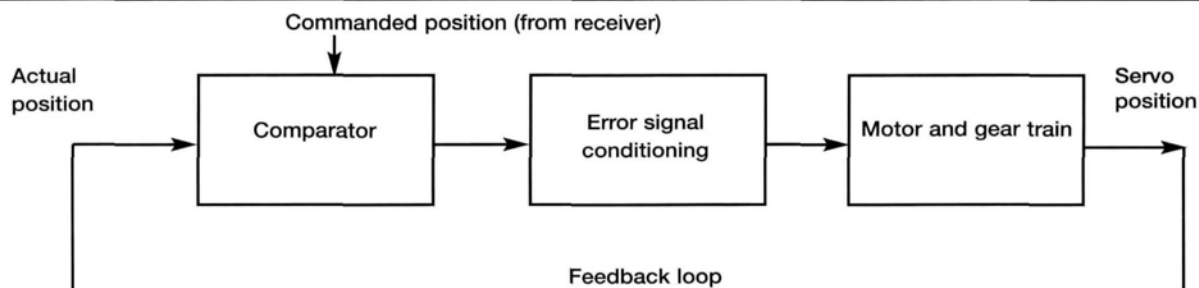
FROM (brand below)/TO:	AIRTRONICS OLD	FUTABA	HITEC, JR, AIRTRONICS Z
Airtronics/Sanwa old	no change	W, C	W, C
Futaba	W, C	no change	C
Hitec, JR, Airtronics Z	W, C	no change	no change

W = wire order change needed in connector (see Fig. 3)

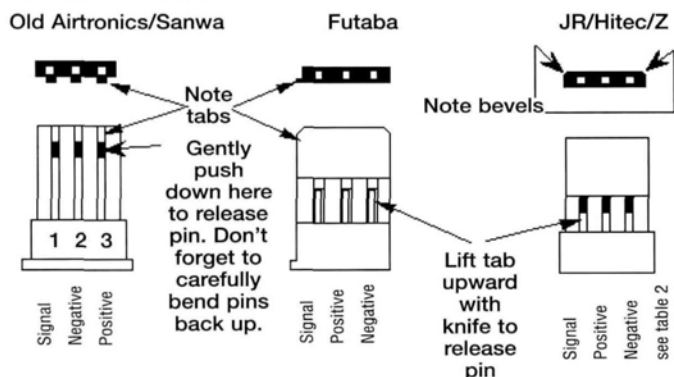
C = connector housing modification needed (see Figs. 3 and 4)



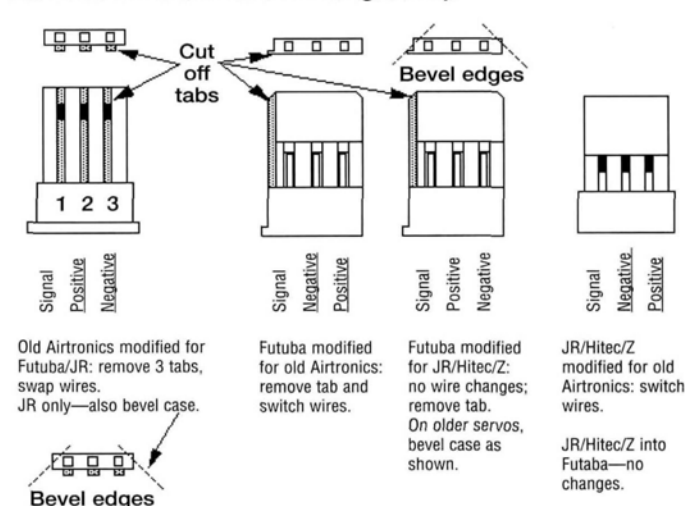
**Figure 2.**  
A schematic of the "feedback loop" contained inside a servo, which is the key to fast, accurate performance.



**Figure 3.** Configurations for stock servo connectors on the major radio manufacturers.



**Figure 4.** Modified connectors for interchanging brands (underlined wires are switched from stock configuration).



interchanging servos from various manufacturers. If your servos are not compatible, and you don't want to modify your connectors, you can buy ready-made, plug-in connector adapters from companies such as Airtronics\* and Custom Electronics\*. Without an adapter, you'll need to physically change the servo connector.

There are three ways to change connectors: remove and reposition the wires and reshape the connector block (if necessary); splice in the desired connector; and solder a new connector wire directly into the servo amp.

a Futaba servo into a Hitec, JR, or Airtronics Z receiver, just remove the tab on the Futaba servo. The newer Futaba servos already have bevels in their housings, but older ones need to have the bevels cut as shown in Figure 4.

A Hitec, JR, or Airtronics Z servo can be plugged into a Futaba receiver without any changes at all, as long as you make sure that the wire positions match. Refer to Table 2 to see how the brands' wire colors correspond (you have to make sure the signal wire on the servo can be plugged into the signal wire position on your brand of receiver).

Older Airtronics (non-Z), Sanwa and Cox use a different wiring order, so you also have to switch wires. This is easily done by removing the wires from the connector housings, carefully moving them around, then re-inserting them into the housing (which also has to be modified as mentioned previously). You'll also need to remove the tabs as shown in Figure 4.

There are different ways of removing wires from the connector housings in various brands of servos. For older Airtronics servos, you have to press a metal pin gen-

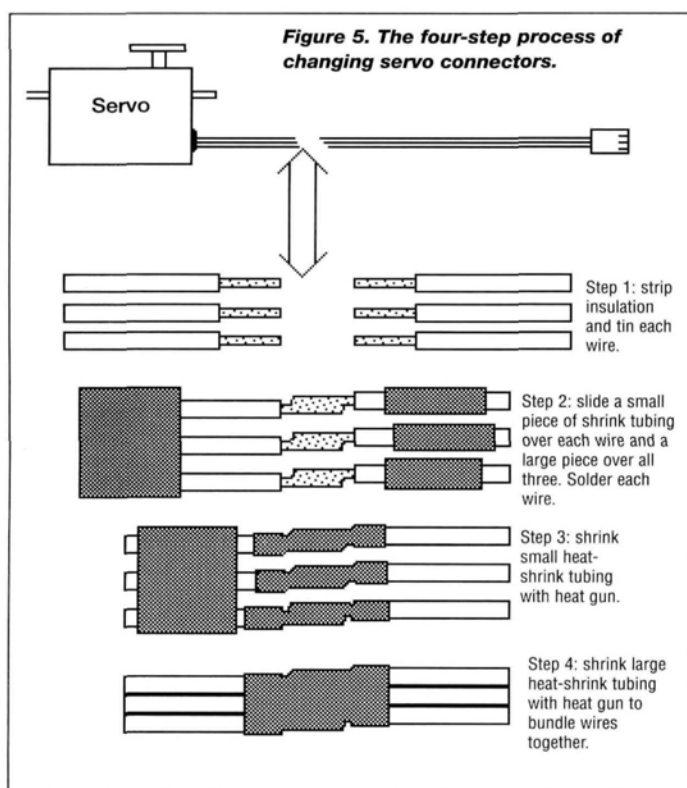
## USING THE EXISTING HOUSING WITH A NEW BRAND

If you want to use your existing connector with the new brand of servo (this is handy for late nights when you can't get a replacement connector and want to fly in the morning!), refer to Table 1 and Figure 3 to see how the wires have to be arranged and how the connector blocks need to be reshaped. For instance, Futaba, Hitec, JR and Airtronics Z all have the same wiring order, so the only changes between them are in the connector housings. To plug

Table 2. Servo wire color chart for various brands

BRAND	POSITIVE	NEGATIVE	SIGNAL
Ace R/C	Red	Black	Orange, blue, or white
Airtronics/Sanwa (nos. refer to connector block)	Red, or black wire with white line (3)	Blue, or middle black wire (2)	White, blue, or black wire farthest from white line (1)
Airtronics Z	Red	Black	Blue
Cannon	Red	Black	Orange, blue, yellow, etc.
Futaba	Red	Black	White
Hitec/RCD	Red	Black	Yellow
Hobby Shack/White Cirrus	Red	Black	White
JR	Red	Brown	Orange
Kraft	Red	Black	Orange





tly down and pull the wire out. For Futaba, Hitec, Airtronics Z and JR servos, you have to lift a slender plastic piece with a hobby knife while pulling the wire.

Drawings of wire and connector arrangements for all of these modifications are shown in Figure 4.

### SPlicing ON A NEW CONNECTOR

If you don't want to "perform surgery" on your connectors, you can splice on the prop-



**The wires must be "tinned" with a soldering iron before you splice them onto an existing servo.**

er connector, as long as you know how to solder. Get a connector that will fit the receiver that you want to use (get it from a hobby store or by cutting an aileron extension cord in half). Now identify the three wires on each of the connectors. It is critically important to identify them correctly (see Table 2), or you could burn out the servo!

Now that you've identified the three wires, you are ready to make the conversion. You'll need the following tools: a wire cutter, wire stripper, heat-shrink tubing, soldering iron and rosin-core solder (do *not*, under any circumstances, use acid-core solder!). These tools and materials are available at RadioShack and other electronics stores.

Now you're ready to begin splicing the connector. With the wire cutters, cut off the existing connector about 1 or 2 inches from the servo. Split the three-wire ribbon apart, and use the wire strippers to strip about 1/8 inch of insulation off the ends of the wires that

come out of the servo and the ends of the wires on the new connector. Twist the exposed metal strands into neat bundles. Heat up the soldering iron and set it on the table with its point facing toward you. With solder, tin each of the three ends of both wires (see Figure 5).

Next, be sure that the ribbon is split enough, then slide a small piece of heat-shrink tubing over each of the three wires on one end (either the servo end or the connector end; the connector end is usually easier because that piece of wire is longer). Put a larger piece of heat-shrink over all three wires. Don't shrink them yet!

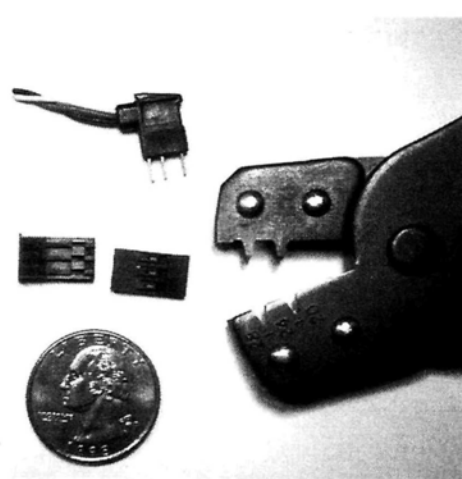
Place the two positive wires side-by-side, and touch them with the soldering iron. The solder should flow across and join the two wires. Carefully pick up the wires together and away from the iron. As soon as the solder cools (5 to 10 seconds), the two wires will be joined. Inspect the joint: it should be smooth and shiny, and the wires should line up nicely. Repeat this procedure with the remaining two wires, checking to see that the correct ones are connected.

After all three pairs of wires have been soldered together, double-check to be sure that you have soldered the correct wires together. Then, shrink the heat-shrink tubing with a heat gun. Be sure that there are no exposed wires, or a short circuit may develop; this could cause your battery or model to catch on fire. Now shrink the outer piece of heat-shrink tubing to hold

all three wires together.

Plug the connector into the receiver and turn on the transmitter and then the receiver. The servo should operate normally. If it doesn't, switch off power immediately and check all the soldered connections.

If you don't like to solder, Custom Electronics and Dymond Model Sport sell crimping tools for about \$20 that allow you to splice a cable (or make custom servo cables) without soldering to produce a clean, professional-looking connector. You'll also need connector pins and housings. You can get contacts and housings for all popular brands of radio gear.



**You can install your own connector hardware with a pin-crimping tool.**

### SOLDERING A NEW CONNECTOR INTO THE SERVO AMP BOARD

If you are really skilled with a soldering iron, another way to change connectors is to simply unsolder the old connector from the servo amplifier printed circuit board and solder in a new one. You'll need a low-power soldering iron (around 15 to 25 watts seems to work well) with a very fine tip. Don't forget to put a rubber grommet on the new connector wires to protect them where they exit the case. Of course, be sure that the wires are connected to the proper location on the servo electronics. This method is only recommended for those who have extensive experience with soldering irons, and if you fit that description, you don't need any further explanation! Just be very careful: it's crowded inside many servos.

Now that you understand the basics of how servos work and how to interchange them, we will investigate how to repair them in the next "Effective Programming" column. Until then, fly safely!

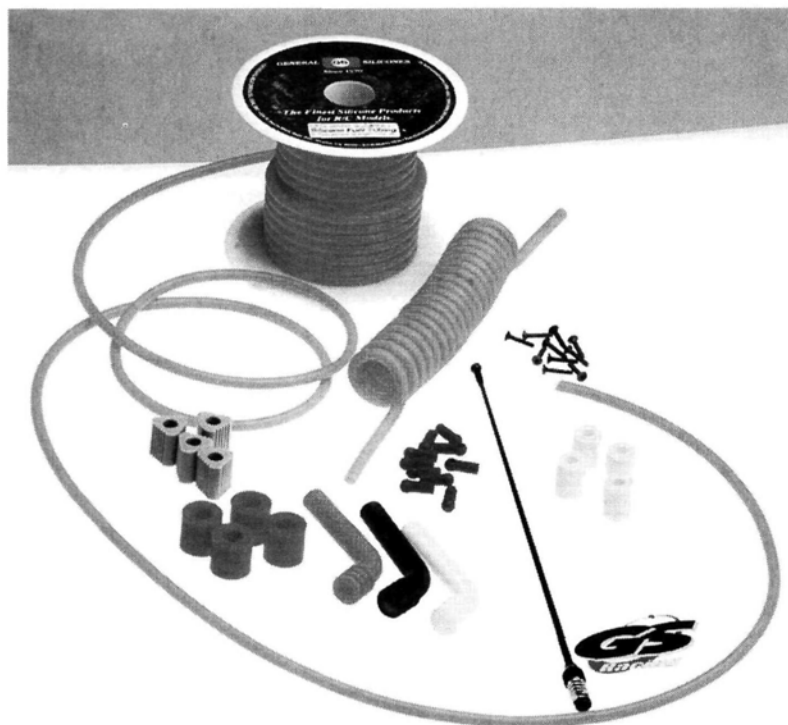
*\*Addresses are listed alphabetically in the Index of Manufacturers on page 134. \**



# PRODUCT WATCH

*Editors' picks of the month*

**AT MODEL AIRPLANE NEWS**, we not only tell you what's new, but we try it out first to bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."



GENERAL SILICONES CO. USA INC.

## Hobby Hardware Lose the blues!

Sometimes, a manufacturer just bowls me over! General Silicones Co. USA offers an amazing array of silicone products and anodized hardware; all work perfectly on a variety of applications. GS's products are top quality and great looking, too! I could easily find a use for every item in its inventory.

My two favorites are the neon silicone fuel line and purple-anodized screws that hold my servos in place (the purple really looks trick against the black servos). Want some fluorescent coiled tubing for your fuel container or a new tuned-pipe coupler? The GS line also includes slick helicopter skid protectors, exhaust deflectors, anodized hardware, colored ball-ends, output arms and more. If your plane needs a little sprucing up, or if regular silicone is giving you the "blues," GS products will make the pit gang do a double take the next time you taxi past the flightline. —Bob Hastings

**General Silicones Co. USA Inc.**, 650 W. Duarte Rd., Ste. 205, Arcadia, CA 91007; (626) 445-6036; fax (626) 445-6084.

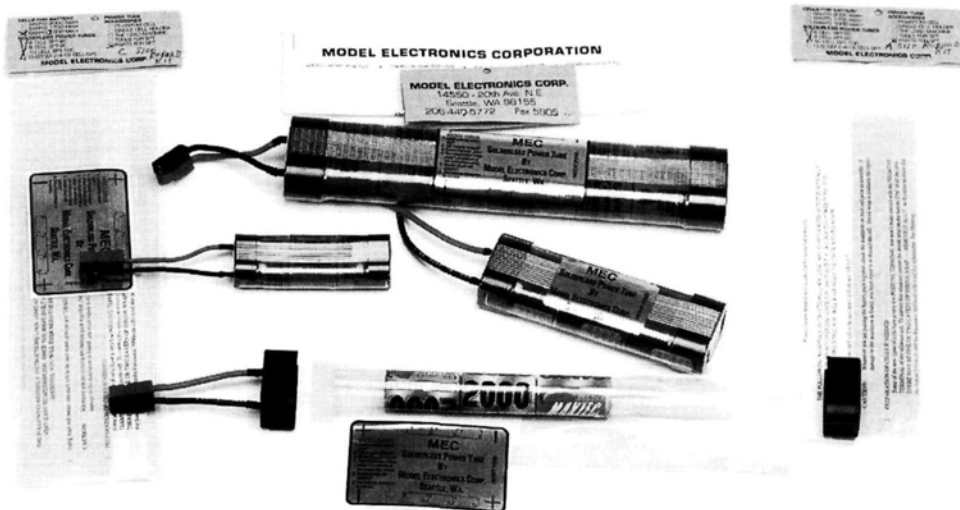
MODEL ELECTRONICS CORP.

## Solderless Power Tubes Packin' power

Making a proper battery pack *used* to require the proper equipment, time, jigs and patience. I recently needed an 8-cell pack for an electric jet that required a touch more "oomph." From start to finish, my new pack was ready, including Power Pole connectors, in the time it takes most soldering irons to heat up. How did I do it so fast? I used a Solderless Power Tube from Model Electronics (MEC). The Power Tubes are packaged according to battery cell size ("A," "sub-C," "C") and wire gauge. It's simple to create battery packs, and if you have a heat gun, a voltmeter and some strapping tape, you'll be all set. First I check my cells with my voltmeter, then I create two stacks of four cells by inserting the batteries "flashlight-style" into a pair of MEC's small, clear, shrink tubes. The cell stacks are stood on end individually and, to ensure good contact, I heat-shrink the stack together while putting downward pressure on the top cell. A quick check with the voltmeter verifies battery continuity. The two stacks are placed into a plastic bottom end cap with the positive end down on one side and the negative down on the other. (To help position the batteries properly, an adhesive battery label has polarities marked on both ends.) Next, I use strapping tape to hold the prewired top cap in place and then sleeve the entire pack using clear heat-shrink. The result is a functional, professional-looking battery pack. If your battery requirements change down the road, MEC also offers "rebuild" kits and accessories.

—Bob Hastings

Price—\$15; rebuild kits from \$4.75.



**Model Electronics Corp.**, 14550 20th Ave. N.E., Seattle, WA 98155; (206) 440-5772; fax (206) 440-5772.



# PRODUCT WATCH

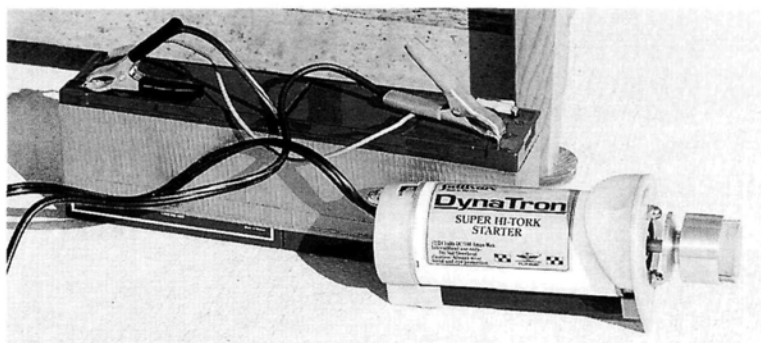
## SULLIVAN PRODUCTS

### **Dynatron Starter** **You'll flip over it!**

Are you still trying to start your giant-scale planes with the same starter you used on your .25 trainer? If it's time for your field accessories to catch up to the size of your squadron, take a look at Sullivan's Dynatron high-output starter.

The Sullivan Dynatron is a 12- or 24V unit that's capable of starting the largest models. According to Sullivan, at 24 volts, the starter develops over 1.5hp, which is "capable of starting almost any model engine." Intended for intermittent operation only, each of the Dynatron's 15-second starting loads must be followed by a one-minute cooling-off period to avoid damage from overheating—not an unusual requirement for such a compact, high-power energy converter. Sullivan provides a limited, two-year warranty to repair or replace at no charge any starter that exhibits defective workmanship, from the date of purchase.

A really nice feature of this starter is the ability to change it from right- to left-handed operation. Sullivan also offers a new S635 starter insert to use with propellers that don't have spinners. —Dave Gierke  
Price—\$75.



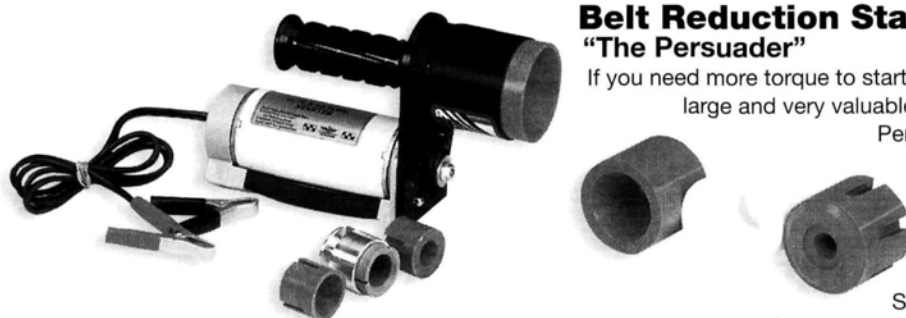
**Sullivan Products**, One North Haven St., Baltimore, MD 21224; (410) 732-3500; fax (410) 327-7443; [www.sullivanproducts.com](http://www.sullivanproducts.com).

## MILLER RC PRODUCTS

### **Belt Reduction Starter Attachment** **"The Persuader"**

If you need more torque to start your engine, or if, for example, you have a unique, large and very valuable spinner on your plane, it's time for "The Persuader." The gang at Miller RC Products created

The Persuader to provide modelers with four times more starting torque by using their unique 4:1 reduction belt drive. The units are designed to be mounted onto specific model starters; you can also buy The Persuader already attached to Sullivan's beefy Dynatron. The Persuader's belt-



reduction assembly is available in 3-, 3½- and 4-inch sizes, with a huge selection of cone and hub inserts. Using the proper attachment cup and inserts, this starter handles from 1- to 6-inch spinners, old-timer 6-bolt hubs, giant-scale racers and more. All of Miller's inserts are available in white rubber so you won't have to worry about your painted or polished spinners. Contact Miller RC Products, and they'll make sure you get the correct setup to suit your starting requirements. —Gerry Yarrish  
Price—\$107 (\$177 w/starter).

**Miller RC Products**, P.O. Box 425, 159 Greene St., Kenwood, CA 95452; (707) 833-5905; fax (707) 833-0059.

## SPECIALTY PRESS

### **Warbird Tech Series, Vols. 23 to 26** **No More Documentation Dilemmas**

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—Geoff Cozine

Price—\$16.95 per book (plus \$4.50 shipping per order).



**Specialty Press**, 11605 Kost Darn Rd., North Branch, MN 55056; (651) 583-3239; fax (651) 583-2023. ★

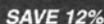
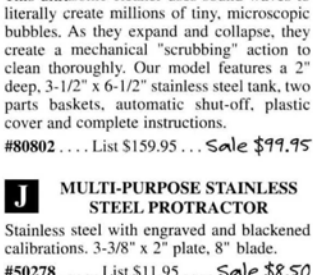
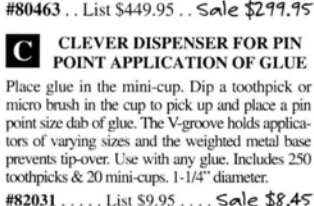
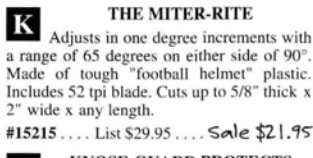
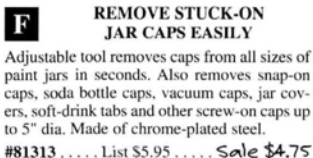
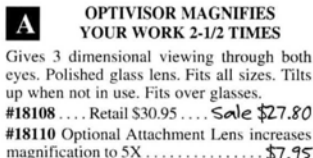
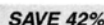


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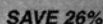
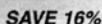
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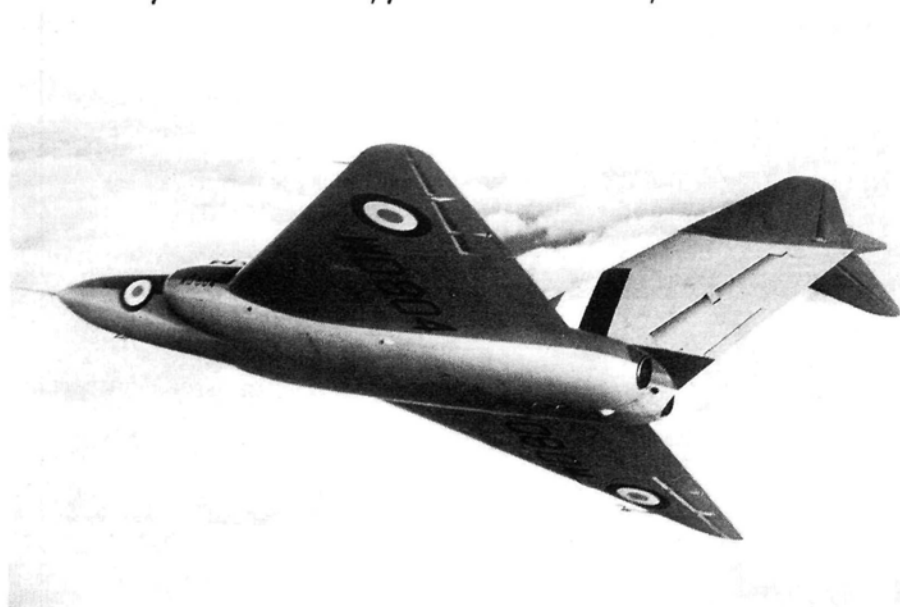
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Many aeronautical sleuths guessed that the February 2000 mystery plane was some U.S. Air Force variant of the VTOL Harrier jump jet. However, sharp-eyed Stuart Galstad of Marshall, MN, receives our congratulations for correctly identifying it as the Bell X-5. This 1951 experimental aircraft was the first to feature variable-sweep wings. The wings in the photo below are in the takeoff/climb/landing position.

This method of designing wings was the model for all such aircraft for 10 years, until the advent of the F-111. The fatal flaw in the X-5's design was that the wings needed to be swept fore and aft to retain stability and control. For this reason, the X-5 did not seem to have enough potential for it to be put into production, although

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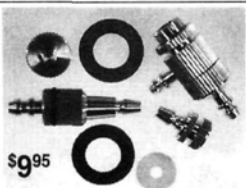
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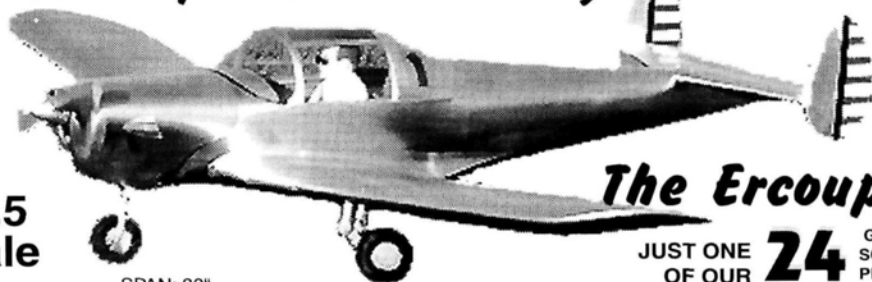
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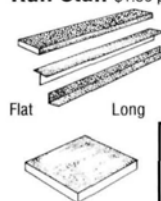
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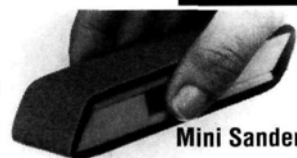
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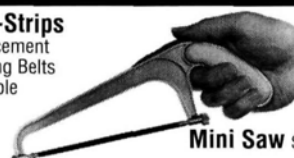
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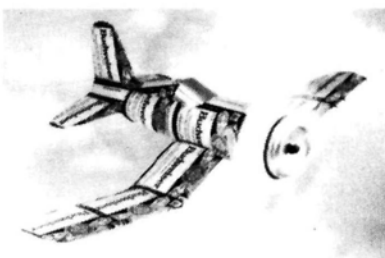
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## RC model building skills proved helpful to space shuttle design

**F**rom 1969 to 1971, there was a competition involving essentially all the aerospace firms: the winner would receive a contract to build a space shuttle vehicle for NASA. An initial contract for the basic shuttle design was let out to several aerospace firms. The Grumman Aerospace Corp. was one of the companies who vied for this contract. All contractors (Grumman included) worked for approximately two years on the initial design phase. After the design was finally selected, a second competition would determine the winner of the contract to actually build the first five space shuttles.

As a young planning engineer at Grumman, I was assigned to the Shuttle Configuration Room in late 1969. This was basically a room filled with large drawing boards and staffed with some of Grumman's most elite designers; people who, in the past, were responsible for some of Grumman's most famous aircraft: the Hellcat, Bearcat, Panther, Cougar, A-6 Intruder and F-14 Tomcat. Day after day, month after month, these designers came up with literally hundreds of concepts for the shuttle. Many referred to these quick sketches as "cartoons." As 1971 approached, the final group of design candidates began to evolve. Since we didn't have 3D computer graphics at the time, we had to resort to making small-scale models out of balsa, plywood and clay to get a rough idea of what we were working with.

Our model shop was producing these models with expert craftsmanship at the rate of one per week, but that wasn't fast enough for our project engineer. Since everyone knew that I was an accomplished RC modeler and therefore had the experience and tools needed, I was asked to take home a drawing and try to build it faster than in the model shop. I

agreed and was "sent home" one morning; my wife thought I came home so early because I was sick. But by the next morning, I was able to bring in my first shuttle model.

These models typically were built on a  $\frac{3}{4}$ -inch plywood backboard; only half a shuttle was produced. A keel made out of  $\frac{1}{8}$ -inch lite-ply was first cemented to the backboard. I then added a series of  $\frac{1}{16}$ -inch plywood sections, or formers (cut in half). Then came a carved balsa wing and vertical fin. Last, I worked common green clay into the spaces between each of the formers. The final models were roughly 22 inches long with a half wingspan of 9 inches. At the rate of one model per day, I must have made several dozen over a period of two or three months.

When Grumman finally selected its candidate design, our model shop built more sophisticated and professional models. As a keepsake, the project engineer, Charles Joseph Goodwin, was kind enough to let me have one of the shuttle models. It was built in January 1971 and has been on my shop wall for the last 28 years. Take a look at the photos, and you can easily see the resemblance between the model and the final space shuttle design. This particular design—Grumman no. G-3A—was probably the final choice.

This Grumman design was selected by NASA, but unfortunately for Grumman, North American Rockwell (NAR) won the actual construction contract. For two years, Grumman sent about 100 engineers to NAR to help them build our design. Grumman was also subcontracted to build the five wing sets in its Long Island facility, but when the shuttle made its first flight, it was considered an NAR-built spacecraft.

Some fond old memories! ✦



PHOTO BY BOB ABERLE

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